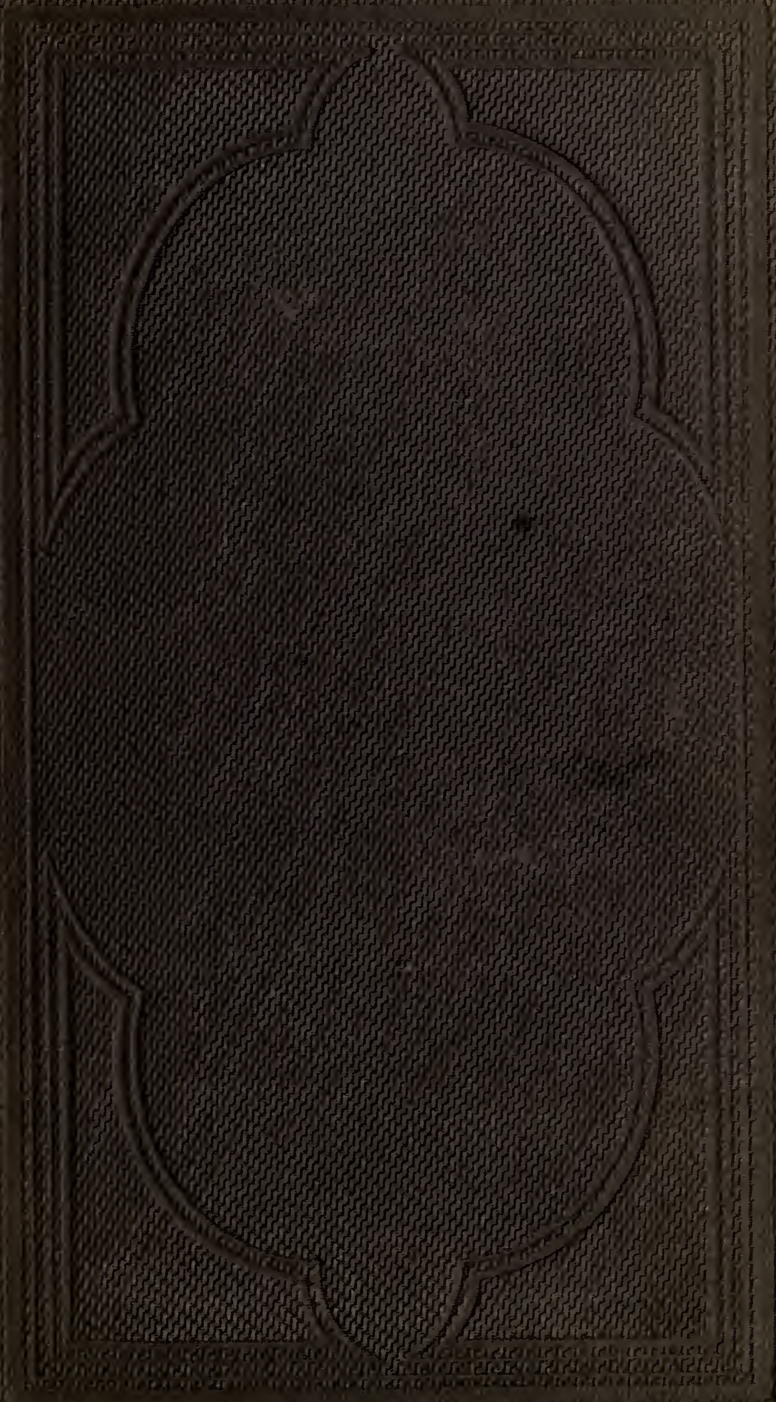

Agric Dept

Main Lib.
Agric. Dept.

LIBRARY
OF THE
UNIVERSITY OF CALIFORNIA.

Received August, 1898

Accessions No. 73291. Class No.

Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

http://www.archive.org/details/dictionchem02wattrich

A

# DICTIONARY OF CHEMISTRY.

VOL. II.

LONDON : PRINTED BY
SPOTTISWOODE AND CO., NEW-STREET SQUARE
AND PARLIAMENT STREET

# A DICTIONARY
# OF
# CHEMISTRY
# AND THE
# ALLIED BRANCHES OF OTHER SCIENCES.

BY

HENRY WATTS, B.A., F.R.S., F.C.S.

EDITOR OF
'THE JOURNAL OF THE CHEMICAL SOCIETY.'

*ASSISTED BY EMINENT CONTRIBUTORS.*

VOL. II.

CONHYDRINE—GYTGE.

NEW EDITION.

LIBRARY
OF THE
UNIVERSITY
OF CALIFORNIA

LONDON:
LONGMANS, GREEN, AND CO.
1882.

QD5
W4
1875
v.2

Main Lib.
Agric. Dept.

73291

UNIVERSITY OF CALIFORNIA

# DICTIONARY OF CHEMISTRY.

**CONHYDRINE.** $C^8H^{17}NO$, or $\mathit{C^{16}H^{17}NO^2}$. (Wertheim, *Wien. Akad. Ber.* xxii. 113.)—This alkaloïd, which has the composition of a hydrate of conine ($C^8H^{15}N.H^2O$), exists, together with conine, in the flowers and ripe seeds of hemlock (*Conium maculatum*). It is extracted by a process which will be described under CONINE, and purified from adhering conine by pressing the product after it has been submitted to a low temperature (by means of a freezing mixture), and subsequently by repeated recrystallisation from ether. 100 kilogr. of fresh flowers yield 6 grammes of pure crystals.

Conhydrine crystallises in laminæ having a pearly lustre and splendid iridescence; they melt at a gentle heat and sublime below 100° C. It has a slight odour, which increases when the substance is volatilised, and closely resembles that of conine. Its aqueous and alcoholic solutions have a strong alkaline reaction. Its physiological action is narcotic, but less powerful than that of conine.

1 pt. of conhydrine, heated to 200° C. for an hour and a half with 3 pts. of anhydrous phosphoric acid in a glass tube, decomposes into conine and water.

Conhydrine neutralises acids, expels ammonia from its compounds, but appears to be separated from its salts by conine. The hydrochlorate is uncrystallisable.

*Chloroplatinate*, $2(C^8H^{17}NO.HCl).PtCl^4$.—An alcoholic solution of conhydrine neutralised with hydrochloric acid is mixed with alcoholic tetrachloride of platinum, care being taken to avoid an excess of the latter, and the whole is placed over sulphuric acid in vacuo; when crystals begin to form, the solution is removed to the air and allowed to evaporate, and the crystals are washed, first with ether-alcohol, then with ether. The salt crystallises in hyacinth-red tablets, from 1 to 4 millim. in length, belonging to the trimetric system. It gave by analysis 27·58 per cent. C, 5·31 H, 4·55 N, and 28·04 Pt, the formula requiring 29·47 C, 5·15 H, 4·01 N, and 28·33 Pt.

**CONICHALCITE.** An arseno-phosphate of copper and calcium, containing also a small quantity of vanadic acid, found at Hinajosa de Cordova in Andalusia. It forms reniform masses of pistachio-green colour inclining to emerald green, and yielding a streak of the same colour. Hardness = 4·5. Specific gravity = 4·123. Subtranslucent. Brittle. Fracture splintery. It contains, according to Fritzsche (Pogg. Ann. lxxvii. 139), 30·68 per cent. $As^2O^5$, 8·81 $P^2O^5$, 1·78 $V^2O^5$, 31·76 CuO, 21·96 CaO, and 5·61 water, whence it may be regarded as

$$\left.\begin{matrix}\frac{1}{2}CuO\\ \frac{1}{2}CaO\end{matrix}\right\}^4\left\{\begin{matrix}\frac{2}{3}As^2O^5\\ \frac{1}{3}P^2O^5\end{matrix}\right. + \tfrac{3}{2}H^2O,\ \text{or}\ \left.\begin{matrix}\frac{1}{2}CuO\\ \frac{1}{2}CaO\end{matrix}\right\}.\left.\begin{matrix}\frac{1}{2}Cu\\ \frac{1}{2}Ca\end{matrix}\right\}^3\left\{\begin{matrix}\frac{2}{3}As\\ \frac{1}{3}P\end{matrix}\right\}^2O^8 + \tfrac{3}{2}H^2O,$$

a small quantity of the arsenic or phosphoric acid being replaced by vanadic acid. (Dana, ii. 421; Rammelsberg, p. 376.)

**CONINE.*** *Coniine*, *Cicutine*, $C^8H^{15}N$, or $\mathit{C^{16}H^{15}N}$.—A volatile alkaloïd which forms the poisonous principle of hemlock (*Conium maculatum*). It was discovered in 1827 by Giesecke (Brandes' Arch. Pharm. xx. 97), but was first prepared in the pure state by Geiger in 1831 (Mag. Pharm. xxxv. 72, 259; xxxvi. 159). Ortigosa (Ann. Ch. Pharm. xlii. 313) assigned to it the formula $\mathit{C^{16}H^{16}N}$; Blyth (Chem. Soc. Qu. J. i. 345) regarded it as $\mathit{C^{17}H^{17}N}$. The formula $C^8H^{15}N$, according to which conine is isomeric with cyanide of œnanthyl or capronitrile, $C^7H^{15}.CN$, was proposed by Gerhardt and adopted by v. Planta and Kekulé (Ann. Ch. Pharm. lxxxix. 129),

---

* See ADDENDA, p. 964.

**CREATINE.** $C^4H^9N^3O^2$, or $C^8H^9N^3O^4$. (Chevreul, J. Pharm. xxi. 234; Pettenkofer, Ann. Ch. Pharm. lii, 97; Liebig, Ann. Ch. Pharm. lxii. 282; Heintz, Pogg. Ann. lxii. 602; lxx. 460; lxxiii. 696; lxxiv. 125; Compt. rend. xxiv. 500; Gregory, Chem. Soc. Qu. J. i. 25; Dessaignes, Compt. rend. xxxviii. 839; xli. 1258; Ann. Ch. Pharm. xcvii. 339; J. Pharm. [3] xxxii. 41; Gm. x. 249; Gerh. i. 530; iii. 939; iv. 893.)—An organic base discovered in 1835 by Chevreul in the juice of flesh; more minutely examined by Liebig in 1847.

*Sources.*—In the muscular flesh of mammalia, birds, amphibia, and fishes. Lean horse-flesh contains 0·070, and the flesh of poultry 0·35 per cent. of creatine. That of the marten yields less than that of poultry, but more than that of other quadrupeds: after horse-flesh follow, in decreasing series, the flesh of the fox, roe-buck, stag, hare, ox, sheep, pig, calf, and pike. Fat animals yield much less creatine than lean ones; *e. g.* a fox fattened on meat for 100 days, yields only $\frac{1}{10}$ as much as one that has been killed in the chase (Liebig). Bullock's heart yields 0·142; the flesh of poultry 0·321; that of the pigeon 0·083, that of cod 0·170; and that of the ray 0·61 per cent. (Gregory). Human flesh yields 0·067 per cent.; that of the alligator likewise contains creatine (Schlossberger, Ann. Ch. Pharm. lxvi. 80; xlix. 344). The flesh of the Rorqual whale (*Balænoptera musculus*) likewise yields a small quantity of creatine. (D. Price, Chem. Soc. Qu. J. iii. 229.)

Städeler, has obtained creatine from the flesh of the dog, pigeon, *Spinox acanthus*, and *Petromyzon fluviatilis* (J. pr. Chem. lxxii. 256). Creatine is likewise found, together with creatinine, in urine; together with creatinine and seroline in blood (Verdeil and Marcet, J. Pharm. [3] xx. 89); and, together with urea, in the brain of pigeons and of dogs. (Städeler.)

It is not yet decided whether creatine exists, as such, in the living animal body, or whether it is formed from creatinine existing therein, by the process of preparation. Creatine and creatinine differ in composition only by the elements of water, and are easily converted one into the other,—creatine into creatinine under the influence of acids, creatinine into creatine, by the action of alkalis, the action in either case being accelerated by heat. Now, in preparing creatine either from flesh-juice or from urine, the usual process is to neutralise with an alkali, and concentrate the liquid by heat; by this process the creatinine existing in the original liquid is sure to be converted partly, if not wholly, into creatine, and it is possible that the whole of the creatine actually obtained may be produced in this way; for there is no simple reaction by which creatine can be detected in the original liquid, in presence of creatinine. From the experiments of Dessaignes (J. Pharm. [3] xxxii. 41), it appears that human urine yields more creatinine and less creatine the more quickly the process of separation is conducted. Liebig (Ann. Ch. Pharm. cviii. 334) found that the fresh urine of a dog which had been fed on meat for some weeks, yielded, when mixed with milk of lime and immediately evaporated, a considerable quantity of creatinine but no creatine, but if left to stand for six weeks before evaporation, it yielded creatine without creatinine. In this case the creatine evidently resulted from the decomposition of the creatinine. Dessaignes is of opinion that the creatine of muscular flesh is likewise produced by the decomposition of creatinine.

*Preparation.* 1. *From muscular flesh.*—*a.* The aqueous extract of beef is evaporated in vacuo; the residue exhausted with alcohol, and the alcohol evaporated till the creatine crystallises out. The greater portion remains, however, in the mother-liquor, being prevented from crystallising by the presence of foreign bodies (Chevreul). In a similar manner, Schlossberger obtained creatine from the flesh of the alligator and purified the crystals by washing with cold alcohol.

*b.* The fresh lean muscular flesh of mammalia or birds, is freed as much as possible from fat (which would stop up the press-bag when the meat is subjected to pressure), and chopped up fine; 5 lbs. of it are then well kneaded with an equal weight of water; the liquid is well pressed out in a coarse linen bag; the residue twice treated with water in a similar manner; 5 lbs. of muscular flesh kneaded together with the expressed liquid; the residue kneaded with the third expressed liquid, and then after pressure with 5 lbs. of pure water; and the united liquids are strained through a cloth. The resulting reddish liquid, which reddens litmus, is kept at 100° C., in a large glass flask over the water-bath, till the albumin and blood-red have completely separated in the form of a coagulum, and a sample of the liquid remains clear when boiled.

To decolorise the liquid obtained from some kinds of meat, it must be heated in a basin till it froths up. The liquid is then strained, first through linen, the coagulum being pressed out, then through paper.* The filtrate is then mixed with saturated baryta-water, the addition of that liquid being continued, even after the filtrate has been rendered neutral or alkaline by it, as long as a precipitate of phosphate of barium and phosphate of magnesium continues to form; the filtrate evaporated in a shallow basin over the water-bath to $\frac{1}{20}$; and the thickish residue set aside, first in a warm place to evaporate further, and then, after crystallisation has commenced, in the cold.* The needles thus obtained are separated from the mother-liquor by filtration, washed first with water, then with alcohol, and dissolved in boiling water; and the solution, if coloured, digested with a small quantity of blood-charcoal, then filtered and left to cool, whereupon it yields pure crystals of creatine (Liebig). If a sufficient quantity of baryta-water has not been added, the crystals will be contaminated with phosphate of magnesium. In that case, the hot aqueous solution must be boiled with a small quantity of hydrated oxide of lead; digested, after filtration, with blood-charcoal, which removes the last traces of lead; and the filtrate again left to crystallise. (Liebig.)

---

* The filtrate obtained from the flesh of the ox, roebuck, hare, or fox, which contains a large quantity of blood, retains a reddish tint; that from veal, poultry, or pike is nearly colourless; game and poultry yield a nearly transparent filtrate, which is very favourable to the obtaining of creatine; horse-flesh and cod yield a turbid filtrate. If the filtrate were evaporated alone, even below 100°, it would become coloured

*c.* The chopped flesh of pike, when boiled with water, swells up to a gummy mass, from which the liquid cannot be expressed. A mixture of the chopped flesh with water must therefore be thrown upon a funnel; small quantities of water allowed to run gradually through; and the slightly turbid, acid liquid, which smells and tastes of fish, separated from the soft, white coagulum, precipitated with baryta-water, then filtered and evaporated. It forms on cooling a colourless jelly, in which, in the course of 24 hours, crystals of creatine begin to form. (Liebig.)

The extract of the flesh of poultry or pigeons deposits brown flakes, together with the creatine crystals; — the flesh of bullock's heart often yields but few of the purer crystals, but a considerable quantity of brown flakes, from which boiling water extracts a large additional quantity of creatine. From skate and cod the juice may be easily expressed, after the flesh has been mixed with rather more than equal quantity of water; the jelly ultimately obtained from it, in which the creatine-crystals form, dissolves readily in cold water, and deposits more crystals: the flesh of cod yields the whitest creatine. From the syrupy mother-liquors of crude creatine, chloride of zinc does not form any zincochloride of creatinine, or only a trace; but the mother-liquors obtained in the recrystallisation of crude creatine yield this precipitate on addition of chloride of zinc. (Gregory.)

*d.* Chopped flesh mixed with coarsely pounded glass, is digested with 1½ times its volume of alcohol at a gentle heat; the liquid is then pressed out and distilled, the residue treated with basic acetate of lead, the excess of lead separated by sulphydric acid, and the clear liquid evaporated to a syrup. On cooling, creatine crystallises out; and after some days the crystalline mass is spread out on unsized paper to absorb the mother-liquor; after which the creatine is dissolved in hot water or alcohol, and recrystallised. (Städeler, J. pr. Chem. lxxii. 256.)

2. *From Zinco-chloride of Creatinine.—a.* The solution of this compound in boiling water is digested with hydrated oxide of lead, till it acquires a strong alkaline reaction; filtered from the oxide of zinc and oxychloride of lead; digested with a little blood-charcoal, which removes the small remaining quantity of lead, together with fibrin; the filtrate evaporated to dryness; and the remaining mixture of creatine and creatinine, treated with an eightfold quantity of boiling alcohol to dissolve out the latter: the alcohol, on cooling, likewise deposits crystals of creatine, which are added to the undissolved residue of creatine, and the whole is purified by recrystallisation. (The alcohol filtered after cooling deposits creatinine: Liebig.)—*b.* The boiling aqueous solution of the zinc-compound is treated with baryta-water, which precipitates zinc-oxide, together with the greater part of the adhering fibrin; carbonic acid gas is passed through the filtrate; the liquid again filtered to separate carbonate of barium; the filtrate evaporated to dryness in vacuo; the residue exhausted with alcohol; the baryta which has been taken up by the alcohol as chloride of barium, precipitated by sulphuric acid; the liquid again filtered, boiled with oxide of lead, treated with absolute alcohol to precipitate all the chloride of lead, and filtered from chloride and sulphate of lead; any lead that may yet remain dissolved is removed by sulphuretted hydrogen; and the filtrate is evaporated to dryness over the water-bath (Pettenkofer). The residue thus obtained contains creatinine as well as creatine (Liebig).—*c.* The boiling aqueous solution of the zinc-compound is mixed with ammonia till it begins to

---

in consequence of the presence of free acid, which would decompose the creatine, and leave a dark-brown syrup, having the odour of roast meat, which would yield but a very small quantity of creatine, even after long standing. This appears to be the reason why Berzelius (Jahresber. viii. 589) and Fr. Simon (N. Br. Arch. xxvi. 283) did not succeed in preparing creatine.

* The filtrate from poultry remains clear when evaporated, and becomes covered with a film of carbonate of barium if too much baryta-water has been added; that from beef becomes covered, when concentrated to a thin syrup, with a mucous scum which swells up in water, but is insoluble and must be removed; and that from veal or horse-flesh with films which are continually renewed, and must be continually skimmed off.

show turbidity, and then precipitated with sulphide of ammonium; the filtrate evaporated to a small bulk, and mixed with absolute alcohol; and the crystals of creatine, which separate from the liquid after long standing in the cold, are purified by recrystallisation from water (Heintz). The creatinine remains in the alcoholic mother-liquor.

The crystals of creatine obtained by either of these processes may be freed from water of crystallisation by heating them to 100° C. (Liebig.)

*Properties.*—Anhydrous creatine forms a white opaque mass (Liebig). It is inodorous, has a somewhat bitter taste, and produces a scratching sensation in the throat (Liebig). Neutral to vegetable colours. (Chevreul.)

The composition of creatine dried at 100° C. is as follows:—

| *Calculation.* | | | *Analyses.* | | |
|---|---|---|---|---|---|
| | | | Liebig.<br>*a.* | Liebig.<br>*b.* | Heintz.<br>*c.* |
| $C^4$ | 48 | 36·64 | 36·66 | 36·90 | 36·39 |
| $H^9$ | 9 | 6·87 | 6·96 | 7·07 | 6·86 |
| $N^3$ | 42 | 32·06 | 32·15 | 32·61 | 31·64 |
| $O^2$ | 32 | 24·43 | 24·23 | 23·42 | 25·11 |
| $C^4H^9N^3O^2$ | 131 | 100·00 | 100·00 | 100·00 | 100·00 |

*a* was obtained from meat; *b*, from zinco-chloride of creatinine prepared from human urine.

The *hydrate*, $C^4H^9N^3O^2.H^2O$, forms perfectly limpid prisms, belonging to the monoclinic system. Inclination of the clinodiagonal to the principal axis = 70° 20′. Inclination of the faces $\infty P : \infty P$ in the plane of the orthodiagonal and principal axis = 133° 2′ (nearly). Specific gravity of the crystals = 1·35 to 1·34.

Creatine dissolves in 74·6 pts. of *water* at 18° C.; it is very soluble in boiling water and is deposited on cooling in a mass of needles. It dissolves in 9410 pts. of *absolute alcohol*, but is more soluble in *aqueous alcohol;* insoluble in *ether*.

*Decompositions.*—1. Hydrated creatine, when heated, first gives off its water of crystallisation with decrepitation; then melts without becoming coloured; afterwards emits an odour of ammonia, hydrocyanic acid, and phosphorus; and lastly, gives off yellow fumes, which condense partly to an oil, partly to needle-shaped crystals, and leaves a small quantity of charcoal (Chevreul).—2. The solution of creatine in aqueous *hypermanganate of potassium* is decolorised by continued digestion, without evolution of gas, the creatine being decomposed and carbonate of potassium formed (Liebig). The aqueous solution of creatine is not decomposed by boiling with *peroxide of lead* (Liebig). It is not coloured by boiling with *mercuric nitrate* (Chevreul).—3. Creatine dissolved in strong *nitric*, *sulphuric*, *phosphoric*, or *hydrochloric acid*, is converted into creatinine by abstraction of $H^2O$, the creatinine then combining with the acid (Liebig). But if these acids are dilute, the creatine remains unaltered, even after long boiling, and the solution in cold hydrochloric acid leaves, by spontaneous evaporation, crystals of pure creatine (Liebig). If dry *hydrochloric acid gas* be passed over 149 pts. (1 at.) of hydrated creatine heated to 100° C., the weight first increases by absorption of hydrochloric acid; but if dry air be then passed through the apparatus for some time, water is continuously given off, and the compound diminishes in weight, till it amounts to only 154·16 pts., and contains 38·05 pts. (a little more than 1 at.) hydrochloric acid. Hence 36 pts. (1 at. of water of crystallisation and 1 at. more produced from the creatine) have been given off, and on the other hand, 38·05 pts. (1 at.) hydrochloric acid have entered into combination with the hydrated creatine:

$$\underset{\text{Hydrated creatine.}}{C^4H^{11}N^3O^3} + HCl = \underset{\text{Hydrochlorate of creatinine.}}{C^4H^7N^3O.HCl} + 2H^2O.$$

131 pts. (1 at.) of dry creatine, similarly treated with hydrochloric acid gas, take up about 18·04 pts., because, in this case, only 18 pts. (1 at.) water are given off for every 36·4 pts. (1 at.) hydrochloric acid taken up (Liebig).—The colourless solution of creatine in *nitric acid* of specific gravity 1·34 gives off nitrous fumes when heated in the water-bath, and leaves on evaporation a colourless residue (of nitrate of creatinine), which dissolves in water, separates out therefrom in small granules, and does not precipitate dichloride of platinum (Chevreul).—4. By boiling with a small quantity of *baryta* dissolved in water, creatine is resolved into sarcosine and urea, which is then quickly resolved by the baryta into carbonic acid and ammonia (Liebig):

$$\underset{\text{Creatine.}}{C^4H^9N^3O^2} + H^2O = \underset{\text{Sarcosine.}}{C^3H^7NO^2} + \underset{\text{Urea.}}{CH^4N^2O}.$$

From this decomposition Strecker (Ann. Ch. Pharm. cxviii. 151) infers that creatine may be regarded as a compound of cyanamide (urea *minus* water) and sarcosine (methyl-glycocine), *i. e.* as $\left.\begin{matrix}CN\\H^2\end{matrix}\right\}N. \left.\begin{matrix}(C^2H^2O)''\\CH^3\\H^2\end{matrix}\right\}\begin{matrix}N\\O\end{matrix}$; or $\left.\begin{matrix}CN\\(C^2H^2O)''\\CH^3\\H^4\end{matrix}\right\}\begin{matrix}N^2\\O.\end{matrix}$ An aqueous solution of creatine saturated at the boiling heat, and mixed with crystals of baryta amounting to 10 times the weight of the creatine, remains clear at first, but, if the boiling be continued, gives off abundance of ammonia; deposits carbonate of barium at the same time; and, if fresh baryta be added from time to time, is ultimately found to contain scarcely any thing but sarcosine and carbonate of barium; and, if the operation be interrupted during the strongest evolution of ammonia, likewise a little urea. A small quantity of another substance, probably urethane, is however produced at the same time: for if the alcohol from which the sulphate of sarcosine has crystallised out, be mixed with water, neutralised with carbonate of barium, filtered, and evaporated to a thin syrup, colourless needles and laminæ are obtained which redden litmus very slightly, fuse and volatilise when heated, without leaving baryta, and dissolve in water, in alcohol, and in 30 pts. of ether; their aqueous solution does not precipitate the salts of barium, calcium, or silver, or neutral acetate of lead, or corrosive sublimate (Liebig).—5. The aqueous solution becomes turbid by long standing (if, according to Liebig, it contains a trace of foreign organic matter), and evolves a sickening ammoniacal odour (Chevreul).—6. When *nitrous gas* is passed into a solution of creatine in nitric acid, an alkali is formed, having the composition $C^3NH^5$ (Dessaignes).—7. When an aqueous solution of creatine is heated with *mercuric oxide*, carbonic acid is evolved, and methyluramine ($C^2H^7N^3$) obtained in the form of an oxalate (Dessaignes):

$$\underset{\text{Creatine.}}{2C^4H^9N^3O^2} + O^5 = \underset{\text{Oxalate of methyl-uramine.}}{2C^2H^7N^3.C^2H^2O^4} + 2CO^2 + H^2O.$$

The same transformation is effected by a mixture of peroxide of lead and sulphuric acid (Dessaignes).—8. Hot *nitric acid* decomposes creatine, yielding methylamine and ammonia (Dessaignes).—9. Creatine heated with *soda-lime*, gives off methylamine. (Dessaignes.)

Salts of Creatine. Creatine is a very weak base, not being capable of neutralising the weakest acids, even when added in very large quantity. (Liebig.)

*Sulphate of Creatine*, $2C^4H^9N^3O^2.SO^4H^2$, and the *Hydrochlorate*, $C^4H^9N^3O^2.HCl$, are obtained in fine prisms by dissolving creatine in the proper quantity of acid, and evaporating the solution at 30° C. or in vacuo; they are soluble in water but not deliquescent. (Dessaignes.)

*Nitrate of Creatine*, $C^4H^9N^3O^2.NO^3H$.—Obtained by dissolving crystallised creatine in the requisite quantity of nitric acid, and evaporating the solution at 30° C.; or by passing a rapid stream of nitrous gas through water containing an excess of creatine in suspension. The creatine dissolves with tolerable rapidity, and a considerable quantity of small shining crystals of the nitrate are formed, which, when recrystallised by dissolving them in lukewarm water and cooling, form thick short prisms. This salt is less soluble in water than the sulphate or hydrochlorate. The solution has a very sour taste, and is decomposed by ammonia with precipitation of creatine. (Dessaignes.)

From a solution in warm baryta-water, creatine crystallises on cooling without taking up any baryta. (Liebig.)

The aqueous solution of creatine does not precipitate chloride of barium, basic acetate of lead, ferric sulphate, cupric sulphate, nitrate of silver, or tetrachloride of platinum (Chevreul). It does not precipitate chloride of zinc, unless it contains creatinine (Heintz). The warm non-boiling, aqueous solution, added to chloride of zinc, does not throw down any crystalline compound, but yields the creatine in the separate state on cooling (Liebig). On boiling the mixture, the zinc-precipitate is formed (Heintz), probably from conversion of the creatine into creatinine.

**CREATININE,** $C^4H^7N^3O$ or $C^8H^7N^3O^2$. (Liebig, Ann. Ch. Pharm. lxii. 298 and 324.—Heintz, Pogg. Ann. lxii. 602; lxxiii. 595; lxxiv. 125.)—Heintz and Pettenkofer, in 1844, and nearly at the same time, discovered in human urine a nitrogenous substance which formed a crystalline precipitate with chloride of zinc. The crystalline substance separated from this precipitate was regarded by Pettenkofer as a peculiar compound = $C^8H^{16}N^6O^3$ [plainly a mixture of creatine and creatinine], by Heintz, at first as an acid, and afterwards as creatine, till Liebig, in 1847, showed that it was a mixture of creatine and creatinine, which latter he had just before discovered and investigated, having obtained it by decomposing creatine with concentrated acids.

*Sources.*—1. In human urine, to the amount of 0·5 per cent. (Pettenkofer), and,

# INDEX

## TO

## THE SECOND VOLUME.

PAGE

- Conhydrine 1
- Conichalcite —
- Conine 1 and 964
  - Salts of Conine 5
  - Substitution-derivatives —
    - Methyl-conine, Ethyl-conine, Diethyl-coninium, Ethylmethyl-coninium 6
- Conistonite 7
- Conite —
- Conium maculatum —
- Conjugated compounds —
- Connective tissue 11
- Connellite 12
- Contact action —
- Convallamaretin 13
- Convallamarin —
- Convallaretin 14
- Convallaria —
- Convallarin —
- Convolvulic acid —
- Convolvulin 15
- Convolvulinolic acid —
- Convolvulaceæ 16
- Conydrine (s. Conhydrine) —
- Copahene or Copaivene — Copahilene (s. Copaiba oil).
- Copahuvic or Copaivic acid (s. Copaiba Resins).
- Copaiba Balsam (s. Balsams, i. 492).
- Copaiba oil —
  - Hydrochlorate of Copahene or Copaivene 17
  - Hydrochlorate of Copahilene —
  - Para-copaiba oil —
- Copaiba resins 18
  - Copaivic acid—Oxycopaivic acid —
  - Acid Copaiba resins —
  - Neutral Copaiba resins 19
- Copaivene —
- Copaivic acid (s. Copaiba resins).
- Copaivilene or Copaivyl —
- Copal —
- Copal varnish 20
- Copalin 21

PAGE

- Copiapite 21
- Copper —
  - Ores of Copper 22
  - Preparation of metallic Copper 23
  - Copper-smelting in reverberatory furnaces: Welsh process 24
  - Copper-smelting in blast furnaces:
    - Swedish process 30
    - Mansfeld process 31
  - Rivot and Phillips's method of Copper smelting 35
  - Copper-smelting in the wet way: *Cementation Copper* 36
  - Impurities in commercial Copper —
  - Physical properties of metallic Copper 38
  - Finely divided copper 40
  - Chemical properties of Copper —
  - Compounds of Copper 41
- Copper, Alloys of —
  - With Aluminium, Antimony, Arsenic —
  - With Bismuth, Cadmium, Gold, Iridium, Iron, Lead 42
  - With Manganese, Mercury, Molybdenum, Nickel, Platinum, Potassium, Silver 43
  - With Tin: *Bronze, Gun-metal, Bell-metal* —
  - With Zinc: *Brass, Tombac,* &c. 47
    - Alloys of Copper, Zinc, and Iron 50
    - Alloys of Copper, Zinc, and Nickel: *Nickel silver,* &c. 51
- Copper, Bromides of —
- Copper, Carbide or Carburet of 52
- Copper, Chlorides of:
  - Protochloride or Cupric chloride —
    - Hydrated protochloride 53
    - Ammonio-cupric chlorides —
    - Double salts of Cupric chloride —
  - Hemichloride or Cuprous chloride 54
    - Aqueous Cuproso-cupric chloride 55
    - Ammonio-cuprous chloride —
    - Double salts of Cuprous chloride 55
- Copper, Detection and Estimation of —

PAGE
Copper, Detection and Estimation of:
1. Reactions in the dry way . . —
2. Reactions in solution . . —
3. Quantitative estimation . . 57
Volumetric methods . . . 58
4. Separation of Copper from other metals . . . . . . 61
5. Valuation of Copper ores . . 63
6. Atomic weight of Copper . . 65
Copper, Emerald (s. Dioptase p. 335).
Copper, Fluorides of . . . . —
Copper, Grey (s. Tetrahedrite) . . 66
Copper, Hydride of . . . . . —
Copper, Indigo (s. Copper, Sulphides of, p. 74).
Copper, Iodides of . . . . . —
Copper, Nitride of . . . . . 67
Copper, Ores of . . . . . . —
Copper, Oxides of
Protoxide or Cupric oxide . . 68
Hydrated Cupric oxide . . 69
Cupric oxygen-salts . . . —
Ammonio-cupric oxide . . —
Hemioxide or Cuprous oxide . . 70
Hydrated Cuprous oxide . . 71
Ammonio-cuprous oxide . . —
Sesquioxide of Copper . . . —
Peroxide of Copper . . . —
Copper, Oxybromide of. . . . . —
Copper, Oxychlorides of . . . 72
Copper, Oxyfluoride of . . . . —
Copper, Oxygen-salts of . . . . —
Copper, Oxysulphides of . . . . —
Copper, Phosphates of . . . . —
Copper, Phosphides of . . . . 73
Copper, Purple (see Sulphides of Copper and Iron, p. 70).
Copper, Red (s. Copper, Oxides of, p. 70).
Copper, Selenides of . . . . . —
Copper, Silicates of . . . . . —
Copper, Silicide of . . . . . —
Copper, Sulphate of . . . . . 74
Copper, Sulphides of . . . . . —
Protosulphide, or Cupric sulphide:
*Covellin*, *Indigo* or *Blue Copper*, *Breithauptite* . . . . . —
Hemisulphide or Cuprous sulphide:
*Copper-glance*, *Vitreous Copper* . —
Sulphides of Copper and Antimony:
*Wolfsbergite*, *Wolchite* . . . 76
Sulphides of Copper and Arsenic . —
Sulphides of Copper and Bismuth:
*Tannenite*, *Wittichenite* . . —
Sulphides of Copper and Iron:
*Copper-pyrites* . . . . . 77
Purple Copper . . . . . 78
Cuban . . . . . . 79
Copper-regulus . . . . . —
Copper, Telluride of . . . . . —
Copper, Tungstate of . . . . . —
Copper, Vanadate of . . . . . —
Copper, Variegated (s. Purple Copper, p. 78).
Copper, Vitreous (s. Copper-glance, p. 74).
Copper-bases, Ammoniacal . . . —
Copper-froth . . . . . . . 81
Copper-glance . . . . . . . —
Copper-glance, Antimonial (p. 75).
Copper, Green . . . . . . —
Copper-mica . . . . . . . —
Copper-nickel . . . . . . —
Copper-pyrites (p. 77).
Copperas . . . . . . . 82

PAGE
Coprolites . . . . . . . 82
Copula . . . . . . . . 83
Coquimbite . . . . . . . —
Coracite . . . . . . . . —
Coral . . . . . . . . 84
Corallina officinalis . . . . . —
Cordierite (s. Dichroïte, p. 320).
Coriander, Oil of . . . . . . —
Coriarin . . . . . . . . —
Cork . . . . . . . . . 85
Cork, Mountain (s. Asbestos, i. 415).
Corneine . . . . . . . . —
Corneous lead . . . . . . —
Cornin or Cornic acid . . . . —
Cornite . . . . . . . . —
Cornovin . . . . . . . . —
Cornubianite . . . . . . . —
Cornus . . . . . . . . —
Cornwallite . . . . . . . —
Cortepinitannic acid . . . . . —
Corticin . . . . . . . . 86
Corundellite (s. Margarite).
Corundophilite . . . . . . —
Corundum . . . . . . . . —
Corydaline . . . . . . . 87
Corydalis bulbosa . . . . . . 88
Cosseine . . . . . . . . —
Cotarnamic acid . . . . . . —
Cotarnic acid . . . . . . . —
Cotarnine . . . . . . . . 89
Salts of Cotarnine . . . . 90
Cotton . . . . . . . . 91
Cotunnite . . . . . . . . 93
Coumaramine . . . . . . . —
Coumaric acid . . . . . . —
Coumarin . . . . . . . . —
Courbaril resin . . . . . . 94
Couzeranite . . . . . . . —
Covellin . . . . . . . . —
Craitonite (s. Crichtonite, p. 108).
Crambe maritima . . . . . . —
Cratægin . . . . . . . . —
Cratinine (s. Creatinine).
Craurite (s. Dufreynite, p. 347).
Cream . . . . . . . . . —
Cream of Tartar . . . . . . —
Creatine . . . . . . . . 95
Salts of Creatine . . . . . 98
Creatinine . . . . . . . —
Salts of Creatinine . . . . 101
Ethyl-creatinine . . . . . 102
Crednerite . . . . . . . . 103
Crenic and Apocrenic acids . . . —
Creosol (p. 105).
Creosote . . . . . . . . —
Creosol . . . . . . . 105
Cresotic acid . . . . . . . 106
Cresoxacetic acid . . . . . . —
Cress, Oil of . . . . . . . —
Cresylic alcohol . . . . . . —
Nitrocresylic acids . . . . . 107
Sulphocresylic or Cresylsulphuric acid . . . . . . . 108
Crichtonite . . . . . . . —
Crispite (s. Rutile).
Crithmum Maritimum . . . . . —
Crocetin (s. Crocin).
Crocin . . . . . . . . . —
Crocidolite . . . . . . . 109
Crocoïsite . . . . . . . . —
Croconic acid . . . . . . . —
Crocoxanthin. . . . . . . 111
Crocus . . . . . . . . . —

PAGE

- Cronstedtite . . . . . . . 111
- Cross-stone or Crucite (s. Chiastolite, i. 868).
- Croton oil . . . . . . . 112
- Crotonic acid . . . . . . —
- Crotonol . . . . . . . 113
- Crotonylene (s. Addenda, p. 965).
- Croupi oil . . . . . . . —
- Crown-glass (s. Glass).
- Crucilite (s Staurolite).
- Crucite (s. Chiastolite, i. 868).
- Crustacea . . . . . . . —
- Cryolite . . . . . . . 114
- Cryptidine . . . . . . . —
- Cryptolin . . . . . . . —
- Cryptolite . . . . . . . —
- Crystallin . . . . . . . —
- Crystalline . . . . . . . —
- Crystallisation . . . . . . —
- Crystallography . . . . . . 116
  - Similar and Dissimilar boundaries . —
  - Simple and Complex forms: *Combinations* . . . . . . 117
  - Axes . . . . . . . 120
  - Polyaxial and Mono-axial forms . —
  - Mode of describing Simple Crystalline forms . . . . . . 121
  - Zones . . . . . . . —
  - Holohedral and Hemihedral forms . —
  - Simple crystals and Twin crystals . —
  - Crystallographic Systems . . —
  - Monometric or Regular System . 122
    - Hemihedral forms . . . . 128
    - Combinations . . . . . 129
  - Dimetric or Quadratic System . 132
    - Combinations of Holohedral forms 134
    - Hemihedral forms . . . . 136
  - Hexagonal System . . . . 137
    - Combinations of Holohedral forms 139
    - Hemihedral forms:
      - Rhombohedrons . . . . 140
      - Scalenohedrons . . . . 141
      - Other hemihedral forms . . 142
  - Trimetric or Rhombic System . 144
    - Combinations of Holohedral forms 146
    - Hemihedral forms . . . . 150
  - Monoclinic System . . . . —
    - Combinations of Holohedral forms 152
    - Hemihedral forms . . . . 156
  - Diclinic System . . . . . 157
  - Triclinic System . . . . . —
  - Aggregations of Crystals . . . 159
  - Twin Crystals . . . . . —
  - Imperfect and Distorted Crystals . 164
  - Cleavage of Crystals . . . . 167
  - Measurement of Crystals . . . 168
    - Hand Goniometer . . . . —
    - Reflecting Goniometer . . . 169
- Cuban . . . . . . . . 171
- Cube-ore . . . . . . . —
- Cubeba Clusii Miq. . . . . . . —
- Cubebene . . . . . . . —
- Cubebin . . . . . . . . —
- Cubebs . . . . . . . . —
- Cubebs, Camphor of . . . . . 172
- Cubebs, Oil of . . . . . . —
- Cubicite (s. Analcime, i. 210).
- Cubilose . . . . . . . . —
- Cuboïcite (s. Chabasite).
- Cuboïte (s. Analcime and Sodalite).
- Cucumis . . . . . . . . —
- Cucurbita . . . . . . . —
- Cudbear (s. Archil. i. 355).

PAGE

- Culebrite . . . . . . . 172
- Culilaban, or Culilawan, Oil of . . —
- Cumene . . . . . . . . 173
  - Nitro- and Dinitro-cumene . . 174
- Cumene-sulphuric acid (s. Cumenyl-sulphurous acid).
- Cumengite . . . . . . . —
- Cumenyl . . . . . . . . —
- Cumenylamine . . . . . . —
  - Cyanocumenylamine . . . 176
  - Nitrocumenylamine . . . . —
- Cumenyl-sulphurous acid . . . . —
- Cumicyl . . . . . . . . 177
- Cumin, Oil of . . . . . . —
- Cuminamic acid (s. Oxycuminamic acid, p. 179).
- Cuminamide or Cumylamide . . . —
  - Cumophenamide or Cumanilide . —
  - Cumo-sulphophenamide . . . —
  - Cumo-sulphophenargentamide . —
  - Cumo-sulphophen-argento-diamide —
  - Cumo-benzo-sulphophenamide . —
  - Cumo-salicylamide . . . . 178
- Cuminic acid . . . . . . . —
  - Nitro- and Dinitro-cuminic acids . —
  - Oxycuminic acid . . . . . 179
  - Oxycuminamic acid: *Amidocuminic acid. Cuminamic acid* . . . —
  - Dioxycuminamic acid: *Diamidocuminic acid* . . . . . . 180
- Cuminic Alcohol (s. Cymylic Alcohol).
- Cuminic Aldehyde (s. Hydride of Cumyl (p. 182).
- Cuminic Anhydride . . . . . —
  - Cuminacetic Anhydride (i. 21).
  - Cumino-benzoic Anhydride (i. 558).
  - Cumino-eugenic Anhydride . . —
  - Cumin-œnanthylic Anhydride . —
  - Cumo-salicylous Anhydride . . —
  - Cumo-methyl-salicylic Anhydride . —
- Cuminic ethers:
  - Cuminate of Ethyl . . . . 181
  - Cuminate of Phenyl . . . . —
- Cuminol (s. Hydride of Cumyl (p. 182).
- Cuminuric acid . . . . . . —
- Cuminyl . . . . . . . . —
- Cummingtonite (s. Hornblende).
- Cumoglycol . . . . . . . —
- Cumol (s. Cumene, p. 173).
- Cumonitrile . . . . . . . —
- Cumophenamide (s. Cuminamide, p. 177).
- Cumosalicyl (s. Cumosalicylous Anhydride, p. 180).
- Cumo-benzo-sulphophenamide, Cumosalicylamide, Cumosulphophenamide } (s. Cuminamide, p. 177).
- Cumoxyl (s. Cumyl).
- Cumoyl . . . . . . . . 182
- Cumyl . . . . . . . . . —
- Cumyl, Hydride of . . . . . —
  - Cumylide of Potassium . . . 183
  - Chlorocuminol . . . . . —
  - Bromocuminol . . . . . —
- Cumyl, Chloride of . . . . . —
- Cumylamide (s. Cuminamide, p. 177).
- Cumylene . . . . . . . . 184
  - Acetate and Benzoate of Cumylene —
- Cumylic acid (s. Cuminic acid, p. 178).
- Cumyl-salicylamide, Cumyl-sulphophenamide } s. Cuminamide (p. 178).
- Cupel . . . . . . . . . —
- Cupramines, Cuprammonias, Cuprammoniums . . . . . . —

PAGE
Cupreous Anglesite (s. Linarite).
Cupreous Manganese . . . . . 185
Cupric compounds (s. Copper, pp. 41, 55).
Cupricum . . . . . . . . —
Cuprite . . . . . . . . . —
Cuproplumbite . . . . . . . —
Cuprosum . . . . . . . . —
Curara . . . . . . . . . —
Curarine . . . . . . . . —
Curcuma (s. Turmeric).
Curcumin . . . . . . . . 186
Cusconine (s. Aricine, i. 357).
Cusparin . . . . . . . . —
Cutin . . . . . . . . . —
Cyamelide . . . . . . . . —
Cyameluric acid . . . . . . 187
Cyamethine . . . . . . . . 188
Cyanamide . . . . . . . . —
  Dicyanodiamide . . . . . 189
  Tricyanotriamide (s. Cyanuramide).
Cyandiethylamide (s. Cyanethylamide).
Cyanethine . . . . . . . . —
Cyanetholine . . . . . . . —
Cyanethylamide . . . . . . 190
Cyanic acid . . . . . . . . —
  Cyanates . . . . . . . 192
Cyanic Ethers . . . . . . . 195
  Cyanates of Allyl, Amyl, Ethyl, . —
  Cyanates of Methyl, Naphthyl, Phenyl . . . . . . 196
Cyanides . . . . . . . . 197
  Cyanides, Metallic . . . . . 198
    Double Cyanides . . . . 199
  Cyanides of Alcohol-radicles . . 202
  Cyanides of Acid-radicles . . . 203
Cyanide of Allyl . . . . . . —
Cyanide of Aluminium . . . . . —
Cyanide of Ammonium . . . . . —
Cyanide of Amyl: *Capronitrile* . . —
Cyanide of Barium . . . . . . —
Cyanide of Benzoyl . . . . . —
Cyanide of Benzyl (i. 573).
Cyanide of Bismuth . . . . . 204
Cyanide of Butyl (s. Cyanide of Tetryl).
Cyanide of Cacodyl (i. 406).
Cyanide of Cadmium . . . . . —
Cyanide of Calcium . . . . . —
Cyanide of Cerium . . . . . . —
Cyanide of Cetyl (i. 840).
Cyanides of Chromium . . . . . —
Cyanide of Cinnamyl (i. 990).
Cyanides of Cobalt . . . . . 205
  Cobalticyanides . . . . . . —
Cyanides of Copper . . . . . 207
  Protocyanide or Cupric Cyanide . —
    Cuprico-cyanide of Potassium . —
  Hemicyanide or Cuprous Cyanide . —
    Cuprosocyanides . . . . . 208
Cyanide of Cumenyl (i. 283).
Cyanide of Ethyl: *Propionitrile* . . 211
  Cyanide of Ethyl and Silver . . 212
  Compounds of Cyanide of Ethyl with Metallic Chlorides . . . . —
Cyanide of Ethylene . . . . . —
Cyanides of Gold . . . . . . —
  Protocyanide or Aurous Cyanide . —
    Aurocyanides . . . . . . —
  Tricyanide or Auric Cyanide . . 213
    Auricyanides . . . . . . —
Cyanide of Hydrogen: *Hydrocyanic acid* 214
  Preparation of the Aqueous acid . 215
  Preparation of the Anhydrous acid 216
  Properties . . . . . . 217

PAGE
Cyanide of Hydrogen:
  Decompositions . . . . . 218
  Detection . . . . . . . —
  Estimation . . . . . . . 219
  Compounds with Metallic Chlorides 220
Cyanides of Iridium . . . . . —
    Iridiocyanides . . . . . 221
Cyanides of Iron . . . . . . —
   Ferrocyanides . . . . . 222
    Ferrocyanide of Aluminium . 223
      Ammonium . —
      Barium . . 224
      Bismuth . . 225
      Cadmium . . —
      Calcium . . —
      Cerium . . —
      Cobalt . . —
    Ferrocyanides of Copper . . —
    Ferrocyanide of Ethyl . . . 226
      Hydrogen . . —
      Iron: *Ferric ferrocyanide; Prussian blue* . 229
     Ammonio-ferric ferrocyanide . —
     Potassio-ferrous ferrocyanide . —
    Ferrocyanide of Lead . . . —
    Ferrocyanides of Magnesium, Manganese, Mercury, Molybdenum, Nickel . . . 230
    Ferrocyanide of Potassium . . —
     Preparation . . . . . 231
     Properties and Decompositions 239
     Reactions with metallic solutions 241
     Estimation . . . . . 242
    Ferrocyanides of Silver, Sodium, Tin, Uranium, and Zinc . . 243
   Ferricyanides:
    Ferricyanides of Ammonium, Copper, Hydrogen . . . 244
    Ferricyanides of Iron:
     *a.* Ferrous ferricyanide: *Turnbull's blue* . . . . . —
     *b.* Ferroso-ferric ferricyanide: *Prussian green* . . 245
     Potassio-ferrous ferricyanide . —
    Ferricyanides of Lead, Magnesium, Nickel . . . . 246
    Ferricyanide of Potassium . . —
     Reactions . . . . . 247
     Estimation . . . . . 249
    Ferricyanide of Sodium . . 250
   Nitroferricyanides or Nitroprussides —
Cyanide of Lead . . . . . . 253
Cyanide of Magnesium . . . . . —
Cyanides of Manganese . . . . . —
Cyanide of Mercury . . . . . —
  Compounds of Cyanide of Mercury with Mercuric oxide, and with Salts . . . . . . 255
Cyanide of Methyl: *Acetonitrile* . . 257
  Compounds with Trichloride of Phosphorus, Metallic chlorides, and Cyanide of Mercury . . 258
Cyanide of Nickel . . . . . . —
Cyanide of Nitrogen . . . . . —
Cyanides of Osmium . . . . . 259
Cyanides of Palladium . . . . 260
Cyanide of Phenyl: *Benzonitrile* (i. 553).
Cyanides of Platinum . . . . . —
  Platinocyanides . . . . . 261
  Platinidcyanides . . . . . 266
Cyanide of Phosphorus (p. 255).
Cyanide of Potassium . . . . . 268
  Testing and Valuation . . . 270

PAGE
Cyanide of Propyl or Trityl (s. Butyronitrile, i. 698).
Cyanides of Rhodium . . . . . 271
Cyanides of Ruthenium . . . . . —
Cyanide of Silver . . . . . . —
Cyanide of Sodium . . . . . 272
Cyanide of Styryl . . . . . . —
Cyanide of Tetryl: *Valeronitrile* . . . —
Cyanide of Thallium . . . . . 273
Cyanide of Titanium . . . . . . —
  Nitrocyanide of Titanium . . . —
Cyanide of Tin . . . . . . . —
Cyanide of Trityl . . . . . . 274
Cyanides of Uranium . . . . . . —
Cyanide of Vanadium . . . . . . —
Cyanide of Yttrium . . . . . . —
Cyanide of Zinc . . . . . . . —
Cyanine . . . . . . . . —
Cyanite (s. Kyanite).
Cyanochrome . . . . . . . 275
Cyanoform? . . . . . . . . —
Cyanogen . . . . . . . . —
Cyanogen, Acetate of . . . . . 277
Cyanogen, Benzoate of? . . . . —
Cyanogen, Bromide of . . . . . —
Cyanogen, Chloride of . . . . . 278
  1. Gaseous Chloride . . . . —
    Compounds with other Chlorides . . . . . . 279
  2. Liquid Chloride . . . . . 280
  3. Solid Chloride . . . . . —
    Chlorocyanic oil . . . . . 282
Cyanogen, Detection and Estimation . 283
Cyanogen, Iodide of . . . . . 284
Cyanogen, Sulphydrates of . . . . 285
Cyanogen, Sulphide of (s. Sulphocyanic Anhydride).
Cyanoïl . . . . . . . . . 286
Cyanolite . . . . . . . . —
Cyanosite . . . . . . . . —
Cyanotoluidine (s. Cyanobenzylamine. i. 576).
Cyanotrichite . . . . . . . —
Cyanous acid . . . . . . . —
Cyanuramic acids . . . . . . 287
  Ammeline . . . . . . . —
  Melanurenic acid . . . . . —
  Ammelide . . . . . . . —
Cyanuramide: *Melamine* . . . . —
Cyanuric acid . . . . . . . 288
  Cyanurates . . . . . . . 289
Cyanuric Ethers . . . . . . 292
  Triethylic Cyanurate . . . . —
  Diethylic Cyanurate . . . . 293
  Cyanurate of Methyl . . . . —
  Cyanurate of Phenyl . . . . 294
Cyanurin . . . . . . . . —
Cyanyl . . . . . . . . . —
Cyanylic acid . . . . . . . —
Cyclamen europæum . . . . . —
Cyclamin . . . . . . . . —
Cyclaminetin . . . . . . . 295
Cyclopite . . . . . . . . —
Cymene or Cymol . . . . . . —
  Nitrocymene . . . . . . 296
  Dinitrocymene . . . . . . 297
Cymene, Bromide of . . . . . —
Cymene, Chloride of . . . . . —
Cymene-sulphuric acid (s. Cymyl-sulphurous acid).
Cymid . . . . . . . . . —
Cymidine (s. Cymylamine).
Cymin (s. Cymene).

PAGE
Cyminic acid (s. Cuminic acid).
Cymoglycol (s. Cumoglycol, p. 181).
Cymol (s. Cymene).
Cymophane (s. Chrysoberyl, i. 958).
Cymyl . . . . . . . . . 297
Cymylamines . . . . . . . —
Cymyl-dithionic acid (s. Cymyl-sulphurous acid).
Cymylic Alcohol . . . . . . 298
Cymyl-sulphurous acid . . . . . —
Cynapine . . . . . . . . 299
Cynene . . . . . . . . . —
Cynodine . . . . . . . . —
Cynosurus cristatus . . . . . —
Cynurenic acid (s. Kynurenic acid).
Cyperus esculentus . . . . . —
Cyprin (s. Vesuvian).
Cypripedin . . . . . . . . 300
Cystine . . . . . . . . . —
Cystinoïd tubercles . . . . . —
Cytisine . . . . . . . . 301

D.

Dactylis . . . . . . . . 301
Dadyl . . . . . . . . . —
Dædalia quercina . . . . . . —
Daggod (s. Birch-tar, i. 589).
Daguerreotype (s. Light, Chemical action of).
Dahlia . . . . . . . . . —
Dalanouite (s. Delanovite).
Dalarnite . . . . . . . . —
Daleiochin or Thalleiochin . . . —
Damaluric and Damolic acids . . . —
Damascus Steel (s. Iron).
Dammara resin, Australian . . . —
  East Indian . . . —
Dammaric acid (s. Dammara resin, Australian).
Dammarin (s. Dammara resin, East Indian).
Dammarol } (s. Dammara resin, Australian).
Dammarone }
Dammar-puti } (s. Dammara resin, East Indian).
Dammaryl }
Dammarylic acid }
Damourite . . . . . . . . 303
Danaïte . . . . . . . . . —
Danburite . . . . . . . . —
Dannemorite . . . . . . . —
Daphnetin . . . . . . . . —
Daphnin . . . . . . . . 304
Dapicho . . . . . . . . 305
Darwinite . . . . . . . . —
Dassipis (s. Hyraceum).
Dates . . . . . . . . . —
Datholite . . . . . . . . —
Datisca cannabina . . . . . 306
Datiscetin . . . . . . . . —
Datiscin . . . . . . . . —
Datolite (s. Datholite).
Datura . . . . . . . . . 307
Daucus Carrota . . . . . . —
Dauphinite (s. *Anatase*).
Davidsonite . . . . . . . —
Davy Lamp (i. 1101).
Davyne . . . . . . . . . —
Davyte (s. Stypterite),
Decantation . . . . . . . 308
Dechenite . . . . . . . . —
Decoction . . . . . . . . —

PAGE
Decrepitation . . . . . . 308
Decolorimeter . . . . . . —
Decomposition (s. Chemical Affinity, i. 853).
Degeroïte or Degeröeite . . . . 309
Deïamba . . . . . . . —
Delanovite . . . . . . . —
Delessite . . . . . . . —
Deliquescence . . . . . . —
Delphin . . . . . . . —
Delphinic acid . . . . . . —
Delphinine . . . . . . . 310
Delphinite (s. Epidote, p. 489).
Delphinium . . . . . . —
Delphinone (s. Valerone).
Delvauxite . . . . . . . —
Demidoffite . . . . . . . —
Dendrachates . . . . . . 311
Dendrites . . . . . . . —
Deoxidation . . . . . . . —
Dephlegmation . . . . . . —
Dephlogistication . . . . . . —
Depilatories . . . . . . . —
Dermatin . . . . . . . —
Density (s. Specific Gravity).
Descloïzite . . . . . . . —
Desmin (s. Stilbite).
Desoxalic acid (s. Racemo-carbonic acid).
Detonation . . . . . . . —
Deuto-compounds . . . . . . 312
Devonite (s. Wavellite).
Deweyllite . . . . . . . —
Dextrin . . . . . . . —
Dextrin-sugar . . . . . . 314
Dextrin-syrup (s. Dextrin).
Dextroracemic or Dextrotartaric acid . —
Diabase . . . . . . . —
Diabetic sugar . . . . . . —
Diaclasite . . . . . . . —
Diadochite . . . . . . . —
Diagometer . . . . . . . —
Diagonite (s. Brewsterite, i. 663).
Diagrydium . . . . . . . —
Diallage . . . . . . . —
Diallagite, Diallogite, or Dialogite . 315
Diallyl-urea (s. Carbamide, i. 754, and Sinapoline).
Dialuramide . . . . . . . —
Dialuric acid . . . . . . . —
Dialysis . . . . . . . 316
Diamagnetism . . . . . . 317
Diamond . . . . . . . —
Diana . . . . . . . . 318
Dianic acid . . . . . . . —
Dianite . . . . . . . . 319
Diaphanite (s. Diphanite).
Diaphorite . . . . . . . —
Diaspore . . . . . . . —
Diastase . . . . . . . —
Diastase, animal . . . . . . 320
Diastasite . . . . . . . —
Diaterebic acid (s. Terebic acid).
Diathermanous . . . . . . —
Diazo-compounds . . . . . . —
Dichroïsm . . . . . . . —
Dichroïte . . . . . . . —
Di-compounds . . . . . . 321
Dictamnus albus . . . . . —
Didrimite or Didymite . . . . —
Didymium . . . . . . . —
Didymium, Chloride of . . . . —
Didymium, Detection and Estimation of —
Didymium, Oxides of . . . . 322
PAGE
Didymium, Sulphide of . . . 322
Diffluan . . . . . . . . —
Diffusion . . . . . . . 323
Diformene or Biformene . . . . —
Digenite . . . . . . . —
Digester or Digestor . . . . . —
Digestion . . . . . . . —
Digestion, Animal . . . . . —
Digestive Salt . . . . . . 327
Digestor (s. Digester).
Digitalacrin . . . . . . . 328
Digitalein . . . . . . . —
Digitaletin . . . . . . . —
Digitalic acid . . . . . . —
Digitalicrin (s. Digitalacrin).
Digitalin . . . . . . . —
Digitalin-fat (s. Digitalacrin).
Digitaliretin . . . . . . 329
Digitalis . . . . . . . —
Digitalissic acid (s. Digitalis).
Digitalosmin . . . . . . . 330
Digitoleic acid . . . . . . —
Dihydrite . . . . . . . —
Dilatation (s. Heat).
Dilatometer . . . . . . . —
Dilituric acid . . . . 330 and 965
Dillnite . . . . . . . . 331
Dill, Oil of . . . . . . . —
Dimagnetite . . . . . . . —
Dimetaphosphoric acid (s. Phosphorus, oxygen-acids of).
Dimorphine . . . . . . . —
Dimorphism and Trimorphism . . —
Dinite . . . . . . . . 334
Dinitrammonyl and Dibromonitracetonitrile (s. Trinitracetonitrile).
Dinitroethylic and Dinitromethylic acids (s. Nitrous ethers).
Diopside . . . . . . . —
Dioptase . . . . . . . 335
Diorite . . . . . . . . —
Dioscorea . . . . . . . —
Diosma crenata . . . . . . 336
Dioxylite (s. Lanarkite).
Diphanite . . . . . . . —
Diphenin . . . . . . . —
Diplobase (s. Alstonite, i. 149).
Diploite . . . . . . . . —
Dippel's oil . . . . . . . —
Dipyre . . . . . . . . —
Disacrone . . . . . . . —
Disacryl . . . . . . . —
Discrasite (s. Antimonial Silver, i. 317).
Disomose (s. Nickel-glance).
Disterrite (s. Clintonite, i. 1026).
Disthene (s. Kyanite).
Disinfectants . . . . . . . 337
Distillation . . . . . . . —
Distillation, Dry or Destructive . . —
Disulph-anisolic, -benzolic, -etholic, -metholic, and -propolic acids (s. Sulphurous ethers).
Ditetryl . . . . . . . . 342
Dithionic acid (s. Sulphur, Oxygen-acids of).
Diuret (s. Biuret, i. 600).
Divi-divi . . . . . . . —
Docimasy . . . . . . . —
Doeglal . . . . . . . . —
Doeglic acid . . . . . . —
Doegling Train-oil . . . . . —
Dog-tooth spar . . . . . . 343
Dolerin . . . . . . . . —

PAGE
Dolerite . . . 343
Dolomite . . . —
Dome . . . 344
Domeykite . . . —
Domite . . . —
Donaria . . . —
Dopplerite . . . 345
Dracenine, Dracine, or Draconine (s. Dragon's Blood).
Draco mitigatus . . . —
Dracol . . . —
Draconic acid (s. Anisic acid).
Draconide } (s. Dragon's Blood).
Draconine }
Draconyl . . . —
Draconyl or Dragonyl, Chloride of . . . —
Dragomite } (s. Rock-crystal).
Dragonite }
Dragonic acid (s. Anisic acid).
Dragon's Blood . . . —
Drawing-slate . . . 346
Dreelite . . . —
Drupacin . . . —
Druse . . . —
Dryabalanops Camphora . . . —
Drymis Winteri . . . —
Dschut (s. Jute).
Ducktownite . . . 347
Ductility . . . —
Dufrenite . . . —
Dufrenoysite . . . —
Dulcamarin . . . —
Dulcarin (s. Bittersweet, i. 600).
Dulcin (s. Dulcite).
Dulcinan (s. Dulcitan).
Dulcitan . . . 348
Dulcitanides . . . —
  Benzo-, Butyro-, and Stearo-dulcitan . . . —
Dulcitartaric acid . . . —
Dulcite and Melampyrite . . . —
  Dulcitates . . . 350
  Hex- and Tetra-nitrodulcite . . . 351
  Dulcisulphuric acid . . . —
Dulcose (s. Dulcite) . . . —
Dumasin . . . —
Dumasite . . . —
Dumerillia . . . —
Dyeing . . . 352
  Action of Mordants . . . —
  Steam-colours . . . 354
  Pigment-printing . . . —
  Red dyes . . . 355
  Blue dyes . . . —
  Yellow dyes . . . 356
  Crimson, Pink, Cherry-colour, Purple, &c.: *Aniline-dyes* . . . —
  Green dyes . . . 358
  Browns, Greys, and Blacks . . . —
Dyhenyles . . . 359
Dyotriyles . . . —
Dyoxylite (s. Lanarkite).
Dysclazite (s. Okenite).
Dyskolite (s. Saussurite).
Dysluite . . . 360
Dyslysin . . . —
Dyslyte (s. Eulyte, p. 606).
Dyslytite . . . —
Dysnite or Dyssnite (s. Rhodonite).
Dysodyl . . . —
Dysintribite . . . —
Dystomite (s. Datholite).

E.

PAGE
Earths . . . 360
Earthy Cobalt } (s. Wad).
Earthy Manganese }
Eau de Cologne . . . 361
Eau de Javelle . . . —
Eau de Luce . . . —
Eblanin (s. Pyroxanthin).
Ebonite . . . —
Ebony . . . —
Ebullioscope . . . —
Ebullition (s. Heat).
Ecgonine . . . —
Echinites . . . —
Eclogite . . . —
Eddoes . . . —
Edelforsite or Ædelforsite . . . —
Edelite . . . 362
Edenite . . . —
Educt . . . —
Edulcoration . . . —
Edwardsite (s. Monazite).
Effervescence . . . —
Efflorescence . . . —
Egeran (s. Idocrase).
Egg . . . 363
  Eggs of Birds . . . —
    Changes of the egg during incubation . . . 364
  Eggs of Fishes . . . 365
  Eggs of Reptiles . . . 366
  Eggs of Arachnida and Insects . . . —
  Eggs of Mollusca . . . —
Ehlite . . . 367
Ehrenbergite . . . —
Ekbergite . . . —
Elaene . . . —
Elæolite . . . —
Elæometer . . . —
Elæoptene . . . 368
Elæosaccharum . . . —
Elaërin . . . -
Elaic acid (s. Oleic acid).
Elaïdic acid . . . —
Elaïdic ethers . . . —
Elaïdin . . . —
Elain (s Olein).
Elain-phosphoric and Elain-sulphuric acids (s. Oleo-phosphoric and oleo-sulphuric acids).
Elaiodic acid (s. Ricinoleic acid).
Elaiometer . . . 369
Elaldehyde . . . —
Elaone (s. Oleone).
Elasmose . . . —
Elastic Bitumin (s. Elaterite).
Elastic tissue . . . —
Elasticity . . . —
  Elasticity of Gases . . . 370
    Liquids . . . —
    Solids . . . 372
Elaterin . . . 373
Elaterite . . . 374
Elaterium . . . —
Elathin . . . —
Elatin (s. Elaterin).
Elayl (s. Ethylene).
Elecampin (s. Inulin).
Electricity . . . —
  Excitement by Friction . . . —
  Conductors and Insulators . . . 375
  Of the two Electricities . . . 376

PAGE

- Electricity:
  - Theory of Electricity . . . 377
  - Electrical Machines . . . 378
  - Electroscopes and Electrometers . 380
  - Laws of Electric Attraction and Repulsion . . . . . 381
  - Distribution of Electricity . . 382
    - Quantity and Intensity of Charge 383
  - Development of Electricity by Induction or Influence . . 384
    - Electrophorus . . . . 385
    - Condenser . . . . . . —
    - Coated Plate and Leyden Jar . 386
      - Unit-jar . . . . . . 388
  - The Electric Discharge . . . —
    - Discharge through Air and other Gases; the *Electric Light* . —
      - Spark, Brush, and Glow . 389
      - Dark discharge . . 390
      - Discharge in Rarefied air . —
      - Discharge in different Gases . 391
      - Luminous discharge in Liquids and Solids . . . . 393
      - Duration of the Electric Light —
    - Velocity of the Electric discharge —
    - Mechanical and Thermic effects of the Electric discharge . 395
    - Chemical effects of the Electric discharge . . . . . 397
    - Magnetic effects of the Electric discharge . . . . . 398
  - Molecular Theory of Electric action 399
  - Theory of a Single Electric fluid . 404
  - Development of Electricity by Mechanical action:
    - 1\. By Friction . . . . 405
      - Friction of Good Conductors 406
    - 2\. By Pressure . . . . 409
    - 3\. By Cleavage and Separation of Surfaces . . . . . —
    - 4\. By Vibration . . . . 410
  - Development of Electricity by Heat:
    - 1\. In Crystals. *Pyro-electricity* . 411
    - 2\. In Good Conductors. *Thermo-electricity* . . . . 412
  - Development of Electricity by Chemical action: *Galvanic* or *Voltaic Electricity* . . . 414
    - 1\. By the Chemical action of Liquids on Solids: *Voltaic Battery* . . . . . —
      - Simple Voltaic circuit or Voltaic couple . . . 415
      - Compound Voltaic Circuit; Voltaic Pile or Battery . 422
      - Constant Batteries . . 424
    - 2\. By the Chemical action of Solutions one upon the other . 427
      - Becquerel's *Oxygen-circuit* . 428
    - 3\. By the Mutual action of Gases and Liquids; *Polarisation. Gas-batteries.* . . . 429
      - Grove's Gas-battery . . 430
      - Passive state of metals . —
    - 4\. By Combustion . . . 431
  - Chemical Effects of the Electric Current: *Electrolysis* . . . 432
    - Positive and Negative Elements or Radicles . . . . —
    - Relation between Conduction and Decomposition . . . . 435
    - Secondary Products of Electrolysis . . . . . . —
    - Electrolytic reduction of metals . 437

PAGE

- Electricity:
  - *Electrolysis:*
    - Law of Definite Electrolytic action 438
    - Relations between the Quantity and Intensity of the Current and its Decomposing power . 440
  - Magnetic action of the Electric Current: *Electro-magnetism* . 442
    - Galvanoscopes and Galvanometers . . . . . . 443
    - Action of the Magnet upon the Current . . . . . 444
    - Mutual action of Electric Currents 446
      - Ampère's Theory of Magnetism 447
    - Magnetisation by the Electric Current . . . . . 448
  - Electro-dynamic Induction: *Magneto-electricity* . . . . 451
    - Induced currents of higher orders 453
    - Theory of Electro-magnetic Induction . . . . . 454
    - Magneto-electric machines . . 455
      - Induction coil . . . . 458
  - Measurement of the force of Electric Currents . . . . 459
    - Ohm's Formulæ . . . —
    - The Tangent Galvanometer or Tangent Compass . . . 460
    - The Sine Galvanometer or Sine Compass . . . . . 461
    - Comparison between the Magnetic Galvanometer and the Voltameter . . . . —
    - Reduction of the force of the Electric Current to Absolute Mechanical Measure . . 462
  - Electric resistance of Conductors 463
    - The Rheostat or Current-regulator . . . . . . 464
    - Conducting powers of metals, &c. 466
  - —Heating Effects of the Electric Current . . . . . 467
  - Light produced by the Electric Current . . . . . 471
  - Physiological action of the Electric Current: *Animal Electricity* . 473
    - General Law of Nervous Excitation by the Current . . —
    - The Muscular Current . . 474
    - The Nervous current . . . 476
    - Electric Fishes . . . . —
  - Development of Electricity in Plants . . . . . . 478
- Electricity, Atmospheric . . . —
- Electrodes . . . . . . . 481
- Electro-dynamics . . . . . . —
- Electrolysis . . . . . . . —
- Electro-magnetism . . . . . —
- Electrometer . . . . . . . —
- Electro-motive Force . . . . —
- Electromotor . . . . . . . —
- Electro-negative, and Electro-positive —
- Electro-nitrogurets . . . . . —
- Electrophorus (p. 385).
- Electro-plating . . . . . . —
- Electroscope . . . . . . . —
- Electrotype . . . . . . . —
- Electrum . . . . . . . —
- Elementary Analysis (s. Analysis, Organic, i. 225).
- Elements . . . . . . . 482
- Elemi . . . . . . . . —
- Elemin . . . . . . . . 483
- Elephant's Fat . . . . . . —

PAGE
Elephant's Urine . . . . . . 483
Elhuyarite . . . . . . . —
Eliquation . . . . . . . —
Eliasite . . . . . . . . 484
Ellagic acid . . . . . . . —
Elutriation . . . . . . . —
Embolite . . . . . . . . —
Embrithite . . . . . . . 485
Emerald . . . . . . . . —
Emerald Nickel . . . . . . —
Emeraldine (see Dyeing, p. 358).
Emery . . . . . . . . —
Emerylite . . . . . . . . —
Emetine . . . . . . . . —
Emmonite . . . . . . . . —
Emodin . . . . . . . . —
Emplectite . . . . . . . 486
Empyreuma . . . . . . . —
Emulsic acid . . . . . . . —
Emulsin . . . . . . . . —
Emulsion . . . . . . . . —
Emydin . . . . . . . . 487
Enallochrome (s. Aesculin, i. 60).
Enamel . . . . . . . . —
Enargite . . . . . . . . —
Enceladite . . . . . . . 488
Endellionite (s. Bournonite).
Endive . . . . . . . . —
Endomaderm (s. Chitin).
Endophacin . . . . . . . —
Endosmose (s. Osmose).
Engelhardite (s. Zircon).
Enstatite . . . . . . . . —
Eoïdin . . . . . . . . 489
Ephesite . . . . . . . . —
Epibromhydrin (s. Bromhydrins i. 667).
Epichlorhydrin (s. Clorhydrins i. 894; also ii. 898).
Epichlorite . . . . . . . —
Epichlorobromhydrin (ii. 899).
Epidermis of Animals (s. Horny Tissue). . . . . . . —
Epidermis of Plants . . . . . —
Epidermose (s. Horny Tissue)
Epidesmine (s. Epistilbite).
Epidibromhydrin (ii. 899).
Epidichlorhydrin (s. Chlorhydrins, i. 894; also ii. 899).
Epidote . . . . . . . . —
Epiglaubite . . . . . . . 491
Epi-iodhydrin (ii. 898).
Epsomite or Epsom salt . . . . —
Epistilbite . . . . . . . —
Equations, Chemical (s. Notation)
Equisetic acid (s. Aconitic acid).
Equisetum . . . . . . . . —
Equivalents . . . . . . . —
Erbium . . . . . . . . 496
Eremacausis . . . . . . . 497
Erdmannite . . . . . . . 499
Eremite . . . . . . . . —
Ergotine . . . . . . . . —
Erica carnea . . . . . . . —
Erica vulgaris (s. Calluna, i. 722).
Ericaceæ . . . . . . . . —
Ericinol . . . . . . . . —
Ericinone . . . . . . . . 500
Ericolin . . . . . . . . —
Erinite . . . . . . . . 501
Eriophorum vaginatum . . . . —
Eritannic acid . . . . . . —
Erlanite . . . . . . . . —
Ersbyite . . . . . . . . —

PAGE
Erubescite . . . . . . . 501
Erucic acid . . . . . . . —
Erucin . . . . . . . . —
Ervum Lens (s. Lentil). . . . . —
Eryglucin (s. Erythromannite)
Erypicrin (s. Picroerythrin, p. 503).
Erysimum Alliaria . . . . . —
Erythrarsin . . . . . . . 502
Erythretin . . . . . . . . —
Erythrelic acid . . . . . . —
Erythric acid or Erythrin . . . . —
Picroerythrin . . . . . . 503
Erythrine (s. Cobalt-bloom, i. 1057).
Erythrite . . . . . . . . —
Erythrobetic acid . . . . . . —
Erythrodanum . . . . . . . —
Erythrogen . . . . . . . . —
Erythrogenic acid . . . . . . —
Erythrogluci-sulphuric acid (s. Erythromanni-sulphuric acid, p. 506).
Erythroglucin (s. Erythromannite).
Erythroleic acid . . . . . . 504
Erythrolein or Erythrolitmin . . . —
Erythrolesic acid (s. Erythretic acid).
Erythrolic acid . . . . . . —
Erythromannite . . . . 504 and 967
Nitro-erythromannite . . . . 505
Erythromannitic ethers . . . . —
Erythronium . . . . . . . 506
Erythrophyll . . . . . . . —
Erythroprotide . . . . . . —
Erythroretin . . . . . . . —
Erythrose . . . . . . . . —
Erythrosin . . . . . . . . —
Erythroxyline . . . . . . . —
Erythroxylon Coca (s. Coca, i. 1059).
Erythrozyme . . . . . . . —
Erythrylin . . . . . . . . —
Escherite . . . . . . . . —
Eschholtzia californica . . . . —
Eschwegite . . . . . . . . 507
Esculin (s. Aesculin), i. 60.
Esenbeckine . . . . . . . —
Esmarkite . . . . . . . . —
Esparsette (s. Hedysarum).
Esrar . . . . . . . . . —
Essences . . . . . . . . —
Essenite . . . . . . . . —
Ester . . . . . . . . . —
Ethal (s. Cetylic Alcohol, i. 841).
Ethalic acid (s. Palmitic acid).
Ethalol . . . . . . . . —
Ethalene (s. Palmitene).
Ethalyl . . . . . . . . —
Ethamide, Ethamine, Ethammine . . —
Ethamine-sulphuric acid (s. Sulphethamic acid).
Ethene (s. Ethylene).
Ethenides . . . . . . . . —
Ether . . . . . . . . . —
Etherene (s. Ethylene).
Etherification . . . . . . . —
Etherin and Etherol . . . . . —
Etherinamone . . . . . . . 508
Etheriplatinic acid . . . . . —
Etherol (s. Etherin).
Etherone . . . . . . . . —
Ethers . . . . . . . . . —
Ethers containing Monatomic Alcohol-radicles:
1. Oxides . . . . . . 510
2. Sulphides, Selenides, Tellurides . . . . . 511

PAGE
Ethers—containing Monatomic Alcohol-radicles:
3. Oxygen-salts:
a. Containing Monatomic Acid-radicles 512
b. Containing Diatomic Acid-radicles 514
c. Containing Triatomic Acid-radicles 516
4. Haloid Salts of Monatomic Alcohol-radicles —
Ethers containing Diatomic Alcohol-radicles; *Glycol-ethers*:
1. Oxides 517
2. Oxygen-salts 518
3. Haloïd-salts 519
Ethers containing Triatomic Alcohol-radicles —
Ethers containing Tetratomic Alcohol-radicles 521
Ethers containing Hexatomic Alcohol-radicles —
Polyethylenic, Polyglyceric ethers, &c. 522
Ethers, Acetic 523
Ethers, Bromhydric or Hydrobromic —
Ethide, Boric (see Ethyl, Boride of, p. 526).
Ethionic acid —
Ethionic Anhydride —
Ethyl 524
Ethyl-amyl 525
Ethyl-tetryl —
Ethyl, Antimonides of (s. Antimony-radicles, Organic, i. 339).
Ethyl, Arsenides of (s. Arsenic-radicles, Organic, i. 397).
Ethyl, Boride of: *Borethyl* —
Ammonio-borethyl 526
Oxide of Borethyl 527
Dioxethylo-borethyl and Dioxhydro-borethyl —
Ethyl, Bromide of 528
Ethyl, Chloride of —
Chlorinated Derivatives of Chloride of Ethyl 530
Monochlorinated Chloride of Ethyl 531
Di-, Tri-, Tetra-, and Per-chlorinated Chloride of Ethyl 532
Heavy Hydrochloric ether —
Ethyl, Chloroplatinate of —
Ethyl, Chlorosulphate of —
Ethyl, Cyanide of —
Ethyl, Fluoride of 533
Ethyl, Hydrate of (s. Alcohol, i. 72).
Ethyl, Hydride of —
Ethyl, Iodide of 533 and 967
Ethyl, Nitrides of (s. Ethylamines).
Ethyl, Oxide of: *Ethylic ether* 536
Chlorinated and Sulphuretted Derivatives of Ethylic ether:
Monochlorethylic ether 540
Dichlorethylic ether —
Sulphethylic ether 541
Chlorosulphethylic ether —
Perchlorethylic ether —
Perchlorobromethylic ether —
Double Ethers containing Ethyl:
*Ethylates*:—
Ethylate of Amyl (i. 205).
Ethylate of Cetyl (i. 842).
Ethylate of Benzylene (i. 578).
Ethylates of Ethylene (ii. 579).
Ethylate of Methyl 542

PAGE
Ethyl, Oxide of—Ethylates:
Ethylate of Octyl 542
Ethylate of Potassium —
Ethylate of Sodium 543
Ethylate of Tetryl —
Ethyl, Phosphides of (s. Phosphorus-bases).
Ethyl, Plumbides of (s. Plumbethyls).
Ethyl, Selenhydrate of —
Ethyl, Selenide of 544
Ethyl, Stannides of (s. Stannethyls).
Ethyl, Sulphides of:—
Protosulphide 545 and 967
Compounds of Ethylic Sulphide with Metallic Chlorides: *Mercury and platinum-compounds* —
Chlorinated Derivatives of Ethylic Sulphide:
Di- and Tri-chlorethylic Sulphides —
Tetra- and Per-chlorethylic Sulphides 546
Disulphide of Ethyl —
Tri- and Penta-sulphides 547
Ethyl, Sulphydrate of —
Sulphethylates, or Mercaptides 548
Zeise's Indifferent Sulphuretted Oil 549
Ethyl, Telluride of, or Tellurethyl 550
Salts of Tellurethyl —
Ethylacetamide 552
Ethyl-diacetamide —
Ethylamines and Ethylammoniums —
Ethylamine 553
Salts of Ethylamine 556
Substitution-products of Ethylamine:
Dichlorethylamine 558
Dibromethylamine —
Di-iodethylamine —
Diethylamine —
Triethylamine 559
Triethyl-carbotriamine, or Triethyl-cyanodiamine 560
Diethyl-amylamine —
Tetrethylammonium 561
Triethylamylammonium 563
Triethyl-oxethyl-acetyl-ammonium —
Triethyl-oxacetyl-ammonium —
Ethylammonium (s. Ethylamines).
Ethylamyl (s. Ethyl, p. 526).
Ethylamylcitric acid 564
Ethylamylic ether (i. 205).
Ethylaniline (s. Phenylamines).
Ethyl-bases (s. Ethylamines, Ethyl-arsines, -phosphines, &c.
Ethyl-benzylamine (s. Benzethylamine, i. 576).
Ethyl-bromaniline (s. Phenylamine, Derivatives of).
Ethyl-butylic ether (s. Ethyl, Oxide of, p. 543).
Ethyl-cacodyl (s. Arsendiethyl, i. 397).
Ethyl-carbamic acid (s. Carbamic acid, i. 751).
Ethyl-carbamides —
Ethyl-chloraniline (s. Phenylamine, Derivatives of).
Ethyl-codeine (s. Codeine i. 1068).
Ethyl-conine (s. Conine, ii. 5).
Ethyl-cyanamide (s. Cyanethylamide).
Ethyl-cyananiline (s. Phenylamine, Derivatives of).
Ethyl-diacetamide (p. 552).

PAGE
Ethyl-dithionic acid (s. Sulphurous ethers).
Ethylene . . . . . . . 565
Ethylene, Acetates of:
  Monoacetate . . . . . 566
  Monethylenic Diacetate . . . 567
  Polyethylenic Diacetates . . —
Ethylene, Acetobutyrate of . . . 568
Ethylene, Aceto-valerate of . . . —
Ethylene, Acetoxychloride of . . —
Ethylene, Acetoxyiodide of . . . —
Ethylene, Benzoate of . . . . —
Ethylene, Bromide of . . . . 569
  Brominated Derivatives of Bromide of Ethylene . . . . 570
Ethylene, Butyrate of . . . . 571
Ethylene, Butyroxychloride of . . —
Ethylene, Chloride of . . . . —
  Chlorinated Derivatives of Chloride of Ethylene . . . . . 573
Ethylene, Chloriodide of . . . 574
Ethylene, Cyanide of . . . . —
Ethylene, Dibromide, Dichloride, and Di-iodide of (s. Ethylene, Bromide, Chloride, and Iodide of).
Ethylene, Ethylates of . . . . —
Ethylene, Hydrates of, or Ethylenic Alcohols . . . . . . . —
  Monoethylenic Alcohol: *Glycol* . —
    Ethylenates of Sodium . . 576
  Polyethylenic alcohols . . . —
Ethylene, Hydroxybromide of . . 577
Ethylene, Hydroxychloride of . . —
Ethylene, Hydroxyiodide of . . . 578
Ethylene, Iodide of . . . . —
Ethylene, Iodated . . . . . 579
Ethylene, Iodochloride of . 579 and 968
Ethylene, Oxide of . . . . 579
  Dioxethylene . . . . . 580
  Compound of Ethylenic Oxide with Aldehyde . . . . —
Ethylene, Oxybromide of . . . —
Ethylene, Oxysulphide of . . . —
  Dioxysulphide of Ethylene . . 581
Ethylene, Oxysulphydrate of . . —
  Diethylenic Oxysulphydrate . . —
Ethylene, Stearate of . . . . 582
Ethylene, Succinate of . . . . —
Ethylene, Sulphate (acid) of . . . 582
Ethylene, Sulphides of . . . . —
Ethylene, Sulphites of . . . . 583
Ethylene, Sulphobromide of . . . —
Ethylene, Sulphochlorides of . . . —
Ethylene, Sulphydrates of . . . 585
Ethylene-bases . . . . . . —
  Diamines . . . . . . —
  Ethylene-diamines containing monatomic and Diatomic Alcohol-radicles . . . . . 587
  Ethylene-triamines . . . . 588
    Ethylated Ethylene-triamines . 590
  Ethylene-tetramines . . . 591
    Ethylated Tetrammoniums . . —
  Monatomic Bases produced by the action of Dibromide of Ethylene on Ammonia and the Monamines 593
  Oxethylenamines or Ethylene-hydoramines . . . . . . —
Ethylene-carbamides . . . . . 595
Ethylene-dichloride of Platinum . . —
Ethylene-hydoramines (s. Ethylene-bases, p. 594)

PAGE
Ethylene-phenylamines (s. Phenylamine).
Ethylene-phosphines (s. Phosphorus-bases).
Ethylene-succinic acid (p. 582).
Ethylene-sulphuric acid (p. 582).
Ethylene-sulphurous acids (s. Sulphurous ethers).
Ethylene-tetramines and -triamines (p. 588).
Ethylene-ureas (s. Ethylene-carbamides p. 595).
Ethylidene . . . . . . . . 598
  Bromide, Chloride, and Oxychloride of Ethylidene . . . . 599
  Chlorethylate of Ethylidene . . 600
Ethyl-formamide (s. Formamide).
Ethyl-formyl . . . . . . . —
Ethyl-glycocine (s. Glycocine, p. 905).
Ethyl-glycollic acid (s. Glycollic ethers, p. 916).
Ethyl-hemipinic acid (s. Hemipinic ethers).
Ethylia (s. Ethylamine).
Ethylides or Ethides . . . . . —
Ethyl-lactic acid (s. Lactic ethers).
Ethyl-malic acid (s. Malic ethers).
Ethyl-meconic acid (s. Meconic ethers).
Ethyl-mellic acid (s. Mellic ethers).
Ethyl-mercaptan (s. Ethyl, Sulphydrate of, p. 547).
Ethyl-methylamines (s. Methylamines).
Ethyl-methyl-coninium (s. Conine, p. 109).
Ethyl-methylic ether (s. Ethyl, Oxide of, p. 542).
Ethyl-morphine (s. Morphine).
Ethyl-mucic acid (s. Mucic ethers).
Ethyl-nicotine (s. Nicotine).
Ethyl-nitraniline (s. Nitraniline, under Phenylamines).
Ethyl-nitrophenidine (s. Phenic ethers).
Ethyl-octylic ether (s. Ethyl, Oxide of, p. 542).
Ethyl-oxacetic acid (s. Glycollic ethers, p. 916).
Ethyl-oxalic acid (s. Oxalic ethers).
Ethyl-oxamic acid (s. Oxamic ethers).
Ethyl-oxamide (s. Oxamide).
Ethyl-paratartaric acid (s. Paratartaric acid).
Ethyl-phenylamines (s. Phenylamines).
Ethyl-phosphines (s. Phosphorus-bases).
Ethyl-phosphoric and -phosphorous acids (s. Phosphoric and Phosphorous ethers).
Ethyl-picoline (s. Picoline).
Ethyl-piperidine (s. Piperidine).
Ethyl-pteritannic acid (s. Pteritannic acid).
Ethyl-pyridine (s. Pyridine).
Ethyl-quinine (s. Quinine).
Ethyl-selenhydric acid (s. Ethyl, Selenhydrate of, p. 543).
Ethyl-sinamine (s. Sinamine).
Ethyl-stibines (s. Antimony-radicles, Organic, i. 341).
Ethyl-strychnine (s. Strychnine).
Ethyl-sulphydric acid (s. Ethyl, Sulphydrates of, p. 547).
Ethyl-sulphocarbonic and -sulphophosphoric acids (s. Sulphocarbonic and Sulphophosphoric ethers).

PAGE
Ethyl-sulphuric and -sulphurous acids (s. Sulphuric and Sulphurous ethers).
Ethyl-tannaspidic acid (s. Tannic acids)
Ethyl-tartaric acid (s. Tartaric ethers).
Ethyl-thiosinamine (s. Thiosinamine).
Ethyl-toluidine (s. Toluidine).
Ethyl-trithionic acid (s. Methyl-dithionic acid).
Ethyl-urea (s. Carbamide, i. 754; also ii. 564).
Ethyl-urethane (s. Carbamic acid, i. 751).
Eucairite (s. Eukairite, p. 605).
Eucalyn . . . . . . . . 601
Eucalyptus . . . . . . . —
Eucampite (s. Eukamptite, p. 605).
Euchema spinosum . . . . . —
Euchlorine . . . . . . . —
Euchroïc acid . . . . . . . —
Euchroïte . . . . . . . 602
Euchrone . . . . . . . 603
Euchysiderite . . . . . . . —
Euclase . . . . . . . . —
Euclasite . . . . . . . . —
Eudialyte . . . . . . . . —
Eudiometer (s. Analysis of Gases, i. 268).
Eudiophite . . . . . . . . —
Eugenallophanic acid (s. Allophanic acid, i. 134).
Eugenanisic anhydride . . . . . —
Eugene-glance (s. Polybasite).
Eugenesite . . . . . . . 604
Eugenethyl . . . . . . . —
Eugenic acid . . . . . . . —
Eugenin . . . . . . . . —
Eugeno-benzoic anhydride . . . 605
Eugenol (s. Eugenic acid).
Eugeno-cuminic anhydride (p. 108).
Eugeno-toluylic anhydride . . . . —
Eugetic acid (s. Addenda, p. 968).
Euglena viridis . . . . . . —
Eukairite . . . . . . . . —
Eukamptite . . . . . . . . —
Euklase (s. Euclase).
Eukolyte . . . . . . . . —
Eukolyte-titanite . . . . . . 606
Eulysin . . . . . . . . —
Eulysite . . . . . . . . —
Eulyte and Dyslyte . . . . . —
Eulytin . . . . . . . . —
Eumanite . . . . . . . . —
Euodyl . . . . . . . . —
Euonymin . . . . . . . . —
Euonymite . . . . . . . . —
Eupatorium . . . . . . . . —
Euphorbia . . . . . . . . —
Euphorbic acid }
Euphorbine } (s. Euphorbia).
Euphorbin (s. Euphorbium).
Euphorbium . . . . . . . 607
Euphotide (s. Gabbro).
Euphrasia . . . . . . . . 608
Euphyllite . . . . . . . . —
Eupione . . . . . . . . —
Eupyrchroïte . . . . . . . —
Eurite . . . . . . . . —
Eusynchite . . . . . . . 609
Eutomite . . . . . . . . —
Euxanthic acid . . . . . . —
  Bromeuxanthic acid . . . . 610
  Chloreuxanthic acid . . . . —
  Nitroeuxanthic acid . . . . —
  Coccinonic acid . . . . . —
  Hamathionic acid . . . . . —

PAGE
Euxanthone . . . . . . . 610
Euxenite . . . . . . . . 611
Euzeolite (s. Stilbite).
Evaporation (s. Heat).
Evernia . . . . . . . . —
Evernic acid . . . . . . . —
Everninic acid . . . . . . —
Evernitic acid . . . . . . 612
Exanthalose . . . . . . . 613
Excrements . . . . . . . —
Excretin . . . . . . . . 614
Excretolic acid . . . . . . —
Exophacin . . . . . . . . —
Exosmose (s. Osmose).
Expansion (s. Heat).
Exsiccator . . . . . . . . —
Extract . . . . . . . . —
Eye . . . . . . . . —

F.

Fæces (s. Excrements).
Fagin . . . . . . . . 615
Fagus (s. Beech).
Fahl-erz (s. Tetrahedrite).
Fahlunite . . . . . . . . —
Fassaite . . . . . . . . 616
Fats . . . . . . . . —
Faujasite . . . . . . . . 617
Fayalite . . . . . . . . —
Fayence . . . . . . . . —
Feather-alum . . . . . . . —
Feather-ore . . . . . . . —
Feathers . . . . . . . . —
Feldspar (s. Felspar).
Felsite . . . . . . . . —
Felsobanyite (s. Gibbsite).
Felspar . . . . . . . . 618
  Orthoclase . . . . . . . 619
  Albite . . . . . . . . 621
  Green Felspar of Bodenmais . . 622
Felspathic rocks . . . . . . —
Fennel, Oil of . . . . . . . 623
Fergusonite . . . . . . . —
Fermentation and Putrefaction . . —
  Circumstances which prevent or interrupt these processes . . 625
  Theories of fermentation . . . 626
Fermentation, Acetous . . . . 628
Fermentation, Alcoholic or Vinous —
Fermentation, Butyrous . . . . 631
Fermentation, Gallous or Tannous . —
Fermentation, Lactous . . . . . —
Fermentation, Mucous . . . . 632
Fermentation, Pectous . . . . 633
Fermentation, Saccharous . . . 634
Fermentation, Sinapous . . . . —
Fermentation, Tannous (s. Fermentation, Gallous, p. 631).
Fermentation, Urinous . . . . . —
Fermentation, Vinous (p. 627).
Fermentation, Viscous (s. Fermentation, Mucous, p. 632).
Ferment Oils . . . . . . . —
Ferrates . . . . . . . . 636
Ferric acid . . . . . . . 638
Ferric oxide . . . . . . . —
Ferric salts . . . . . . . —
Ferri- or Ferrid-cyanides (s. Cyanides of Iron, p. 243).
Ferrites . . . . . . . . —

PAGE
Ferrocobaltine . . . . . . 638
Ferrocyanides, Ferroprussiates (s. Cyanides of Iron, p. 222).
Fibrin . . . . . . . . —
  Preparation . . . . . . —
  Formation from Albumin . . 639
  Properties and Composition . . —
  Decompositions . . . . . 640
  Sources and Physiological relations 642
Fibrin, Vegetable . . . . . . 643
Fibroferrite . . . . . . . 644
Fibroïn . . . . . . . . —
Fibrolite . . . . . . . 645
Fichtelite . . . . . . . —
Ficaria . . . . . . . . —
Ficarin . . . . . . . . —
Ficinite (s. Vivianite).
Ficus . . . . . . . . —
Fieldite . . . . . . . . 646
Figure-stone (s. Agalmatolite, i. 60).
Filicic acid . . . . . . . —
Filimelisic acid . . . . . . 647
Filimelisi-sulphuric acid . . . . —
Filipelosic acid . . . . . . —
  Chlorofilipelosic acid . . . . —
Filix . . . . . . . . —
Filixolinic and Filosmylic acids . . —
Filtration . . . . . . . —
Fiorite . . . . . . . . 651
Fireblende . . . . . . . —
Fire-clay . . . . . . . —
Fire-damp . . . . . . . 654
Fire-opal (s. Opal).
Fireworks (s. Pyrotechny).
Firewood (s. Wood).
Fischerite . . . . . . . —
Fish-oil (s. Oils). . . . . . —
Fixed air . . . . . . . —
Fixity . . . . . . . . —
Flake-white . . . . . . . —
Flame . . . . . . . . —
Flavin . . . . . . . . 655
Flavindin . . . . . . . —
Flavine . . . . . . . . 656
Flax . . . . . . . . —
  Composition of the Ash of the Stem and Seed . . . . . . 657
  Composition of Flax-soils . . 658
  Steep-waters . . . . . . 659
  Hot-water steeping . . . . 660
Flesh . . . . . . . . 661
Flesh-juice . . . . . . . 665
  Broth—Liebig's broth for invalids 667
Flexible Sandstone . . . . . —
Flexible Silver ore (s. Sternbergite).
Flint . . . . . . . . —
Flinty Slate (s. Slate).
Floatstone . . . . . . . 668
Flos ferri . . . . . . . —
Flour . . . . . . . . —
Flowers, Colours of . . . . . —
Fluavil . . . . . . . . 669
Flucerine . . . . . . . —
Fluellite . . . . . . . —
Fluoboric acid (s. Boron, Fluoride of, i. 633).
Fluocerine . . . . . . . —
Fluocerite . . . . . . . —
Fluochlore . . . . . . . —
Fluolite . . . . . . . . —
Fluor (s. Fluor spar).
Fluorhydric or Hydrofluoric acid . . —
Fluoride of Aluminium (i. 157).

PAGE
Fluoride of Ammonium . . . . 670
Fluoride of Antimony (i. 322).
Fluoride of Arsenic (i. 317).
Fluoride of Benzoyl . . . . . 671
Fluoride of Barium (i. 504).
Fluoride of Boron (i. 632).
Fluorides of Cadmium, Calcium, Cerium, Cobalt, Copper, &c. (see the several metals).
Fluoride of Ethyl (ii. 533).
Fluoride of Hydrogen (ii. 669).
Fluoride of Phosphorus (s. Phosphorus Fluoride of).
Fluoride of Silicon (s. Silicon, Fluoride of).
Fluorides, Metallic . . . . . —
Fluorides, Organic . . . . . 672
Fluorine . . . . . . . . —
Fluorine, Detection and Estimation of:
  1. Reactions . . . . . . 673
  2. Quantitative estimation . . —
    Estimation in Solutions . . 674
    ——— in insoluble compounds . . 675
    ——— of free Hydrofluoric acid in presence of Fluorides . . —
  3. Separation of Fluorine from other Elements . . . . . —
  4. Atomic weight of Fluorine . 676
Fluor spar . . . . . . . 677
Fluosilicanilide . . . . . . 679
Fluosilicates, Fluotantalates, Fluotitanates (s. Fluorides, p. 671; also Silicon, Tantalum, Titanium).
Flux . . . . . . . . —
Fly-powder . . . . . . . 680
Fodder . . . . . . . . —
Foliated Tellurium (s. Nagyagite).
Food (s. Nutrition).
Formamide . . . . . . . 681
  Naphthyl-formamide . . . . —
  Phenyl-formamide . . . . . 682
Formanilide . . . . . . . —
Formenamine . . . . . . . —
Formene, trinitrated (s. Nitroform).
Formic acid . . . . . . . —
  Occurrence . . . . . . —
  Formation . . . . . 683
  Preparation . . . . . 685
  Properties . . . . . 687
  Decompositions . . . . . —
  Formates . . . . . . 688
Formic Ethers . . . . . . 693
Formomethylal (s. Methylal).
Formonaphthalide (s. Naphthylformamide, p. 681).
Formonetin . . . . . . . 695
Formulæ, Rational . . . . . —
Formyl . . . . . . . . 705
Formylia, Formylamine . . . . —
Formyline . . . . . . . —
Formyl-diphenyl-diamine (s. Phenylamines).
Forsterite . . . . . . . —
Fosresinic acid . . . . . . —
Fournetite . . . . . . . —
Fowlerite . . . . . . . —
Foyaite . . . . . . . . —
Fracture of Minerals . . . . . —
Fragaria . . . . . . . 706
Fraidronite . . . . . . . —
Francolite . . . . . . . —

PAGE
Frangulin . . . . . . . . 706
  Nitrofrangulic acid . . . . 707
Frankincense . . . . . . . —
Franklinite . . . . . . . —
Fraxetin . . . . . . . —
Fraxin . . . . . . . . 708
Fraxinine . . . . . . . 709
Fraxinite . . . . . . . —
Fraxinus . . . . . . . —
Freibergite . . . . . . . 710
Freislebenite . . . . . . . —
French Berries . . . . . . —
French Polish . . . . . . —
Fritillaria imperialis . . . . . —
Fritt . . . . . . . . —
Fruit . . . . . . . . —
Fucus (s. Sea-weed).
Fucusamide . . . . . . . 717
Fucusine . . . . . . . —
Fucusol . . . . . . . . 718
Fuel . . . . . . . . —
  Composition of Coal . . . . 719
    Lignite . . . . 721
    Wood . . . . —
    Peat, Turf . . . —
  Relative calorific powers of various kinds of Fuel . . . . . 723
  Thermal effect of Fuel . . . . 724
Fuller's Earth . . . . . . 730
Fulminates . . . . . . . —
  Fulminate of Copper . . . . 732
  Fulminate of Hydrogen . . . . —
  Fulminate of Mercury . . . . —
  Fulminates of Silver . . . . 733
  Fulminates of Zinc . . . . 737
Fulminic acid (p. 732).
Fulminuric acid . . . . . . 738
  Fulminurates . . . . . . 739
Fulminuric ether . . . . . . 741
Fumaramide . . . . . . . —
Fumaric acid . . . . . . . —
  Fumarates . . . . . . 743
Fumaric anhydride . . . . . 746
Fumaric Ether . . . . . . —
Fumarimide . . . . . . . —
Fumarine . . . . . . . 747
Fumaryl, Chloride of . . . . . —
Fumigation . . . . . . . —
Fuming Liquor of Boyle . . . . —
  Cadet . . . . —
  Libavius . . . . —
Fungic acid . . . . . . . —
Funkite . . . . . . . . —
Furfuramide . . . . . . . —
Furfurine . . . . . . . —
  Furfurine-salts . . . . . 748
  Ethyl-furfurine . . . . . 750
  Amyl-furfurine . . . . . —
Furfurol . . . . . . . . —
  Thiofurfol . . . . . . 752
  Seleniofurfol . . . . . . 753
Fuscite (s. Scapolite).
Fusel oil . . . . . . . —
  Defuselation of Alcohol . . . . 754
Fusible metal . . . . . . 755
Fusion (s. Heat).
Fustic . . . . . . . . —
Fustin . . . . . . . . —
Fusyl . . . . . . . . —
  Disulphide of Fusyl . . . . —

G

PAGE
Gabbro . . . . . . . . . 756
Gabbronite (s. Scapolite). . . . . —
Gadinic acid . . . . . . . —
Gadolinite . . . . . . . 757
Gaduin . . . . . . . . —
Gagates . . . . . . . . —
Gahnite . . . . . . . . —
Galactin . . . . . . . . —
Galactite . . . . . . . 758
Galam-butter . . . . . . . —
Galanga . . . . . . . . —
Galapectite (s. Halloysite).
Galbanum . . . . . . . . —
Galena . . . . . . . . 759
Galipot . . . . . . . . —
Galitannic acid . . . . . . —
Galium . . . . . . . . —
Gall (s. Bile).
Gallamic acid . . . . . . —
Gallerythronic acid . . . . . —
Gallhumic acid . . . . . . —
Gallic acid . . . . . . . —
  Gallates . . . . . . . 761
Gallicenite (s. Rutile).
Gall-nuts . . . . . . . 762
Gallotannic acid . . . . . . —
  Gallotannates . . . . . . 767
Galls (s. Gall-nuts).
Gallstones . . . . . . . 769
Gallulmic acid (s. Gallic acid)
Galvanism (s. Electricity).
Galvanometer . . . . . . —
Galvanoplasty . . . . . . —
Galvanoscope . . . . . . —
Gambir (s. Catechu).
Gamboge . . . . . . . 770
Gamsigradite . . . . . . 771
Gangue . . . . . . . . —
Ganomatite . . . . . . . —
Garanceux . . . . . . . —
Garancin . . . . . . . . —
Garbenstilbite (s. Stilbite).
Garcinia . . . . . . . . —
Gardenia . . . . . . . . —
Garnet . . . . . . . . —
Gas . . . . . . . . . 773
Gas Burners and Furnaces . . . . 783
  Bunsen's Burner . . . . . —
  Griffin's Gas-furnaces for Evaporation, and for Fusion of Silicates, &c. . . . . . . . —
  Griffin's Blast Gas-furnace . . . 785
  Gore's Gas-furnace . . . . 789
Gases, Absorption of:
  I. By Liquids . . . . . 790
  II. By Solids . . . . . 804
Gases, Collection and Preservation of . 805
  Collection in exhausted vessels . . —
  Collection by displacement of air . 806
  Collection in liquids:
    Water and mercury troughs —
    Cooper's mercurial receiver . —
    Gas-holders and Gasometers . 807
    Bunsen's Mercurial Gasometer 808
  Preservation of Gases in sealed tubes . . . . . . . —
Gases, Combination of, by Volume . 809
Gases, Diffusion of . . . . . . 812
Separation of Gases by Diffusion: *Atmolysis* . . . . . . . 815
  Theory of Diffusion . . . . 817

PAGE
Gases, Effusion of . . . . . . 818
Gases, Liquefaction and Solidification of (s. Heat).
Gases, Osmose of . . . . . . —
Gases, Relations of, to Pressure and Temperature . . . . . . . 819
Gases, Specific Gravity of (s. Specific Gravity).
Gases, Specific Heat of (s. Heat).
Gases, Transpiration of . . . . 820
Gasterase . . . . . . . 821
Gastric Juice . . . . . . . —
Gaultheria . . . . . . . 825
Gaultheric acid (s. Methyl-salicylic acid).
Gaultherilene . . . . . . . 826
Gay-Lussite . . . . . . . —
Gedrite . . . . . . . . —
Gehlenite . . . . . . . . —
Geic acid (s. Ulmic acid).
Gelatin . . . . . . . . —
Gelatin, Vegetable (s. Gluten).
Gelidium . . . . . . . —
Gelose . . . . . . . . —
Gems . . . . . . . . 829
Gentian . . . . . . . . —
Gentianic acid . . . . . . 830
Gentianin . . . . . . . —
Geocerain . . . . . . . —
Geoceric acid . . . . . . . —
Geocerinone . . . . . . . 831
Geocronite . . . . . . . —
Geode . . . . . . . . —
Geology, Chemistry of . . . . . —
Geomyricin, Georetic acid (s. Geoceric acid).
Germination of Plants . . . 836
Gersdorffite (s. Nickel-glance). . . 838
Geyserite (s. Opal). . . . . . —
Gibbsite . . . . . . . . —
Gieseckite . . . . . . . . —
Gigantolite . . . . . . . —
Gilbertite . . . . . . . . —
Gilding (s. Gold).
Gillingite (s. Hisingerite).
Gin . . . . . . . . . —
Ginger . . . . . . . . —
Ginseng . . . . . . . . —
Giobertite (s. Magnesite).
Girasol . . . . . . . . —
Gismondin (s. Abrazite).
Githagin (s. Saponin).
Glaiadin (s. Gluten).
Glairin (s. Baregin, i. 500).
Glance . . . . . . . . —
Glaserite . . . . . . . . —
Glass . . . . . . . . . —
    Composition of various kinds of glass:
        Bottle and Window-glass . . 840
        Plate glass. Bohemian glass . 841
        Crystal glass. Flint glass . . —
        Mentz Flux or Pierre de Strass . —
        Aventurin glass. Ruby-glass . 842
        Enamel . . . . . . 843
        Decomposition of glass . . —
        Devitrified glass. Reaumur's Porcelain . . . . . 844
Glaubapatite . . . . . . . 845
Glauber salt (s. Sulphates).
Glauberite . . . . . . . —
Glaucene . . . . . . . . —
Glaucic acid . . . . . . . —
Glaucine . . . . . . . . —
PAGE
Glaucium . . . . . . . . 845
Glaucodote . . . . . . . 846
Glaucolite (s. Scapolite).
Glaucomelanic acid . . . . . —
Glauconite . . . . . . . . —
Glaucophane (s. Wichtyn).
Glaucopicrine . . . . . . —
Glaucosiderite (s. Vivianite).
Glechoma . . . . . . . . —
Gliadin, s. Gluten
Glinkite . . . . . . . . 847
Globularia . . . . . . . . —
Globulin . . . . . . . . —
Glockerite . . . . . . . —
Glonoin (s. Nitroglycerin).
Glossecolite . . . . . . . —
Glottalite . . . . . . . . 848
Glucic acid . . . . . . . —
Glucinum . . . . . . . . 849
    Compounds of Glucinum . . . —
Glucinum, Alloys of . . . . . 851
Glucinum, Bromide of . . . . —
Glucinum, Chloride of . . . . —
Glucinum, Detection and Estimation of:
    1. Reactions . . . . . . —
    2. Quantitative Estimation and Separation . . . . . . —
    3. Atomic Weight . . . . . —
Glucinum, Fluoride of . . . . 852
Glucinum, Iodide of . . . . . —
Glucinum, Oxide of: *Glucina* . . . —
Glucinum, Oxygen-salts of . . . 853
Glucinum, Phosphide of . . . . —
Glucinum, Selenide of . . . . 854
Glucinum, Sulphide of . . . . —
Glucosan . . . . . . . . —
    Acetyl-glucosan . . . . . —
    Benzo-glucosan . . . . . —
    Butyro-glucosan . . . . . —
    Ethyl-glucosan . . . . . 855
Glucose . . . . . . . . . —
    Dextroglucose . . . . . . —
        Occurrence . . . . . . —
        Formation . . . . . . —
        Preparation . . . . . 857
        Properties . . . . . . 858
        Decompositions . . . . . 859
        Combinations:
            With Water . . . . . 862
            With Metallic oxides . . —
            With Bromide and Chloride of Sodium . . . . 863
    Lævoglucose and Inverted Sugar . —
    Lævolusan . . . . . . 864
Glucose, Detection and Estimation of . —
Glucose Ferment . . . . . . 865
Glucosides . . . . . . . . —
Glucosocitric acid . . . . . . 872
Glucososuccinic acid . . . . . —
Glucososulphuric acid . . . . . —
Glucosotartaric acid . . . . . —
Glue . . . . . . . . . 873
Gluten . . . . . . . . . —
Glyceramine . . . . . . . 875
    Diglyceryl-dihydorbromamine . —
    Diglyceryl-dihydorchloramine . 876
Glyceric acid . . . . . . . —
    Glycerates . . . . . . . —
Glycerides . . . . . . . . 877
    Constitution . . . . . . —
    Occurrence and Formation . . 879
    Properties . . . . . . . —
    Decompositions . . . . . —

PAGE

- Glycerides:
  - Glycerides containing Monatomic Alcohol-radicles 882
    - Ethylin 883
    - Ethyl-chlorhydrin —
    - Diethylin —
    - Diethyl-chlorhydrin —
    - Ethyl-chlorobromhydrin —
    - Triethylin 884
    - Amylin —
    - Amylchlor-, -brom-, and -iodhydrin —
    - Diamylin —
    - Ethylamylin —
  - Polyglycerides —
- Glycerin —
  - Formation and Preparation 887
  - Properties —
  - Uses 888
  - Impurities and Adulterations —
  - Decompositions 889
  - Nitroglycerin 890
- Glycerocitric acid 891
- Glycero-oxalic acid —
- Glycerophosphoric acid —
- Glycerosulphuric acid 892
- Glycerotartaric acid 893
- Glyceryl —
- Glyceryl, Bromhydrates and Bromide of (s. Bromhydrins, i. 667).
- Glyceryl, Chlorhydrates and Chloride of (s. Chlorhydrins, i. 893).
- Glyceryl, Hydrates of 894
  - Diglycerin or Pyroglycerin —
    - Chlorhydro-diethyl-pyroglycerin —
    - Triethyl-pyroglycerin —
  - Triglycerin —
    - Tetrethyl-triglycerin 895
  - Diglycide, Pyroglycide, or Metaglycerin —
- Glyceryl, Iodhydrates and Iodide of (s. Iodhydrins).
- Glyceryl, Oxide of —
- Glyceryl, Oxygen-salts of (s. Acetins, Benzoins, Butyrins, &c.).
- Glyceryl, Sulphydrates of —
- Glycide —
- Glycidic ethers —
  - Amylglycide 897
  - Ethyl-glycide —
  - Monobromhydroglycide or Epibromhydrin —
  - Monochlorhydroglycide or Epichlorhydrin 898
  - Mono-iodhydroglycide or Epi-iodhydrin —
  - Dibromhydroglycide or Epidibromhydrin 899
  - Dichlorhydroglycide or Epidichlorhydrin —
  - Chlorobromhydroglycide or Epichlorobromhydrin —
- Glycidyl —
- Glycocholic acid —
  - Glycocholates 901
  - Paraglycocholic acid —
- Glycocine or Glycocol 902
  - Metallic compounds of Glycocine 903
  - Compounds of Glycocine with Acids and Salts 904
  - Ethyl-glycocine 905
  - Dimethyl-glycocine —
  - Di- and Tri-glycollamic acids —

PAGE

- Glycocyamidine 906
- Glycocyamine —
- Glycogen —
- Glycohyocholic acid (s. Hyo-glycocholic acid)
- Glycol, Amylenic (s. Amylene, Hydrates of, i. 208).—Glycol, Ethylenic (s. Ethylene, Hydrates of, p. 574).
- Glycolaldyl 908
- Glycolic ethers —
- Glycollamide —
- Glycollic acid 909
  - Glycollates 910
  - Derivatives of Glycollic acid:
    - Acetoglycollic acid (p. 917).
    - Benzoglycollic acid (i. 548).
    - Bromoglycollic acid 912
    - Diglycollic acid —
    - Diglycolethylenic acid 914
- Glycollic ethers —
  - Methyl-glycollic acid 916
  - Ethyl-glycollic acid —
  - Glycollate of Ethyl 917
  - Amyl-glycollic acid —
  - Phenyl-glycollic acid 918
  - Cresyl-glycollic acid —
- Glycollide —
- Glycols 919
- Glycosine —
- Glycyrretin —
- Glycyrrhizin 920
- Glyoxal —
- Glyoxaline 921
- Glyoxylic acid —
- Gmelinite 924
- Gnaphalium —
- Gneiss —
- Gökumite (s. Idocrase).
- Gold —
  - Occurrence —
  - Extraction 925
  - Properties 926
  - Compounds —
- Gold, Alloys of —
- Gold, Bromide of 927
- Gold, Chlorides of —
  - Chloroaurates 928
- Gold, Detection and Estimation of:
  - 1. Reactions —
  - 2. Quantitative Estimation and Separation —
  - 3. Atomic Weight 929
- Gold, Iodides of —
- Gold, Mannheim 930
- Gold, Metallurgy of (p. 925).
- Gold, Mosaic —
- Gold, Oxides of:
  - Aurous Oxide —
  - Auric oxide: *Aurates* —
- Gold, Oxygen-salts of
  - Sodio-aurous and -auri-sulphites 931
  - Baryto-aurous Hyposulphite —
- Gold, Phosphide of —
- Gold, Sulphides of —
- Gold, Telluride of —
- Gold-amalgam (p. 927).
- Gold-assay 932
- Gold-beater's skin 938
- Gold-beating —
- Gold-purple: *Purple of Cassius* —
- Golden Marcasite 939
- Golden Sulphuret of Antimony —
- Gong-gong —

PAGE
Gongylite . . . 939
Goniometer . . . —
Gorgonia . . . —
Goshenite . . . —
Goslarite . . . —
Gossan . . . 940
Gossypium . . . —
Göthite . . . —
Gotthardite . . . —
Goulard's extract . . . —
Gouty concretions . . . —
Graduation . . . —
Grainer . . . —
Grains of Paradise . . . —
Grain Tin . . . —
Grammatite . . . —
Granatin . . . —
Granite . . . —
Granulation . . . —
Granulite . . . 941
Granulose . . . —
Grape (s. Vine).
Grape-sugar (s. Glucose).
Graphic Gold; Graphic Ore; Graphic Tellurium . . . —
Graphite . . . —
Graphitic acid . . . —
Graphon . . . 942
Grasses . . . —
Grass-oil, East Indian . . . —
Gratiola . . . —
Graulite (s. Tectizite).
Grauwacke . . . —
Gravity, Specific (s. Specific gravity).
Greek Fire . . . —
Green earth . . . —
Green Iron ore . . . 944
Green Lead ore . . . —
Green Pigments . . . —
Green Vitriol . . . —
Greenlandite . . . —
Greenockite . . . —
Greenovite . . . 945
Greensand . . . —
Greenstone . . . —
Grenadin . . . —
Grenatite . . . —
Grengesite . . . —
Grey Antimony . . . —
Grey Copper (s. Tetrahedrite).
Grey Dyes (s. Dyeing, p. 358).
Greywacke (s. Grauwacke).
Groppite . . . —
Groroilite . . . —
Grossular . . . —
Grünauite . . . —
Grünerite . . . —
Guacin . . . —

PAGE
Guaiac (s. Guaiacum).
Guaiacene . . . 945
Guaiacic acid (s. Guaiaretic acid).
Guaiacol . . . 946
Guaiaconic acid . . . 947
Guaiacum . . . —
  Pyroguaiacin . . . 948
Guaiaretic acid . . . —
Guanidine . . . 949
Guanine . . . 950
  Nitroguanine . . . 952
  Oxyguanine . . . —
Guanite (s. Struvite).
Guano . . . —
Guarinite . . . 953
Guayacanite (s. Enargite).
Guizotea . . . —
Gum . . . —
  Gum Arabic . . . —
  Gum Senegal . . . 954
  Cherry-tree gum . . . —
  Gum of Bassora . . . 955
  Gum Tragacanth . . . —
  Gum of Seeds and Roots, or Mucilage . . . —
  Artificial gums:
    *a.* British Gum or Dextrin . . . —
    *b.* Gum from Sugar . . . —
Gumlac . . . —
Gummic acid . . . —
Gum-resins . . . 956
Gun-cotton (s. Pyroxylin).
Gunpowder . . . —
Gurhoffite or Gurhofian . . . 960
Gurolite (s. Gyrolite).
Gutta Percha . . . —
Guyaquilite . . . 962
Gymnite (s. Dewelite, p. 512).
Gypsum . . . —
Gyrolite . . . 963
Gyrophoric acid . . . —
Gyrotrope . . . —
Gytge . . . —

## ADDENDA.

Conine (p. 1) . . . 964
  Azoconhydrine . . . —
  Conylene . . . —
Crotonylene . . . 965
Dilituric acid (p. 330) . . . —
Erythromannite (p. 504) . . . 967
Ethyl, Iodide of (p. 533) . . . —
Ethyl, Protosulphide of (p. 545) . . . —
Ethylene, Iodochloride of (p. 579) . . . 968
Eugetic acid . . . —

END OF THE SECOND VOLUME.

LONDON: PRINTED BY
SPOTTISWOODE AND CO., NEW-STREET SQUARE
AND PARLIAMENT STREET

## COMPLETION OF THE THIRD SUPPLEMENT.

A Dictionary of Chemistry and the Allied Branches of other Sciences. By Henry Watts, B.A. F.R.S. F.C.S. Editor of the Journal of the Chemical Society, assisted by eminent Scientific and Practical Chemists. The Third Supplement, Part II. [or Vol. VIII. Part II.] completing the Record of Chemical Discovery to the end of the year 1878, including the more important Discoveries made in 1879 and 1880. Medium 8vo. pp. 1,340, price 50*s.* cloth.

⁂ The Work complete in Nine Volumes, price £15. 2*s.* 6*d.*

---

### From THE ATHENÆUM, August 20, 1881.

This important work now consists of five volumes and three supplements, the third being in two volumes. There are, therefore, actually nine volumes of closely printed matter, each supplementary volume averaging a thousand pages. This work originated in *A Dictionary of Chemistry and Mineralogy*, by Dr. Andrew Ure, which was highly appreciated in its day. The fourth edition, published in 1831, is now before us, and it consists of 844 pages, within which is comprehended all that was then required in *A Dictionary of Chemistry and Mineralogy*, and much relating to chemical manufactures. The first volume of Mr. Watts's dictionary was published in 1863. The work was then intended to have been complete in four volumes, one of which was published in each year until 1866, when, the end of the letter P only being reached, it was announced as to be completed in five volumes, the fifth volume appearing in 1868. In 1872 the first supplement was issued, and three years after the second supplement followed, the first part of the third supplement being issued in 1879, and the second part in the present year. Nearly eighteen years have thus passed since the commencement of this dictionary, and during that period the science of chemistry has been cultivated with more assiduity and closer attention than in any previous period of the same duration. It has consequently been only by extreme attention to the numerous details of the modern system of chemical inquiry that the present work has been rendered what it really is—a complete history of the science to which it is devoted up to the latest point of time. Mr. WATTS's dictionary is a work which no student can be without if he desires to make himself master of modern chemistry. Full as this dictionary is of really useful information, and excellent as the descriptions are of the chemical compounds brought under notice—which means every combination known up to the date of the last volume—there is a defect in the work which it is not easy to remove. During the eighteen years which have passed since the first volume was published, chemistry as a science has been advancing rapidly, and our knowledge of chemical compounds has been constantly increasing. It has, therefore, been necessary to repeat again and again articles on the same substance. For example, in the first volume is an excellent article on acetic acid, and in each of the three supplements we find articles on acetic acid. It must be stated that the same matter has not been repeated; but the progress of inquiry has rendered it necessary to give the new information obtained. This prevails to a greater or a less extent for all the important articles, and of course the work is thus rendered troublesome to consult. The only course which could be adopted to give the full value to the matter spread through its nine volumes would be to employ a competent number of chemists, gifted with minds capable of clear generalisation, to rewrite the articles. Thus the mass of matter might be reduced by two-thirds. Everything that is important might be retained, the unimportant and useless matter rejected, and the value of the dictionary as representing the state of chemical science up to 1881 would be vastly improved.

LIBRARY
OF THE
UNIVERSITY

NOVEMBER, 1881.

# WORKS ON MEDICINE, SURGERY, AND GENERAL SCIENCE,

PUBLISHED BY

MESSRS. LONGMANS AND CO.,

PATERNOSTER ROW, LONDON.

## Anatomy, Surgery and Physiology.

### THE SCIENCE AND ART OF SURGERY;

Being a Treatise on Surgical Injuries, Diseases, and Operations. By JOHN ERIC ERICHSEN, F.R.C.S., Surgeon-Extraordinary to H.M. Queen Victoria; Member of Council and of the Court of Examiners of the Royal College of Surgeons; Emeritus Professor of Surgery and of Clinical Surgery in University College; Consulting-Surgeon to University College Hospital, and to various Medical Charities. The Seventh Edition, enlarged and carefully revised; pp. 2,072, illustrated by 862 Engravings on Wood. 2 vols. 8vo, price 36*s*.

### A SYSTEM OF SURGERY,

Theoretical and Practical, in Treatises by various Authors. Edited by TIMOTHY HOLMES, M.A., Surgeon and Lecturer on Surgery, St. George's Hospital. Second Edition, thoroughly revised, with numerous Woodcuts, Lithographs, and Chromolithographs; in all 472 Illustrations. In Five Volumes, 8vo, price One Guinea each.

⁂ Each Volume may be had separately, as follows:—

VOL. I., price 21*s*., comprises all the articles on GENERAL PATHOLOGY contained in the First Volume of the previous Edition down to the end of "Collapse," with the addition of Mr. CROFT's essay on Hectic and Traumatic Fever and the After-Treatment of Operations, which formed part of the Appendix to the previous Edition.

VOL. II., price 21*s*., comprises all the Treatises in the previous Edition relating to General and Special Injuries.

VOL. III., price 21*s*.—Diseases of the Eye and Ear, of the Organs of Circulation, Muscles, and Bones.

VOL. IV., price 21*s*.—Diseases of the Organs of Locomotion, of Innervation, of Digestion, of Respiration, and of the Urinary Organs.

VOL. V., price 21*s*.—Diseases of the Genital Organs, of the Breast, Thyroid Gland, and Skin; Operative Surgery; APPENDIX of Miscellaneous Subjects; with a General Alphabetical INDEX to the whole Work, and a List of the Authors.

## QUAIN'S ELEMENTS OF ANATOMY.

The Eighth Edition. Re-edited by WILLIAM SHARPEY, M.D., LL.D., F.R.S., L. & E. Emeritus Professor of Anatomy and Physiology in University College, London; ALLEN THOMSON, M.D., LL.D., F.R.S., L. & E., Professor of Anatomy in the University of Glasgow; and EDWARD ALBERT SCHÄFER, Assistant Professor of Physiology in University College, London. With 1,000 Woodcut Illustrations. 2 vols. 8vo, price 32*s.*

* * *

## ANATOMY, DESCRIPTIVE AND SURGICAL.

By HENRY GRAY, F.R.S., late Lecturer on Anatomy at St. George's Hospital. With 438 large Woodcut Illustrations; those in the First Edition after Original Drawings by Dr. CARTER, from Dissections made by the Author and DR. CARTER; the additional Drawings in the Second and subsequent Editions by DR. WESTMACOTT. Ninth Edition, by T. HOLMES, M.A., Surgeon to St. George's Hospital; with an Introduction on General Anatomy and Development by the EDITOR. Royal 8vo, 30*s.*

* * *

## A MANUAL OF OPERATIVE SURGERY ON THE DEAD BODY.

By THOMAS SMITH, Surgeon to, and Lecturer on Anatomy at, St. Bartholomew's Hospital. A New Edition, re-edited by W. J. WALSHAM, Demonstrator of Anatomy and Operative Surgery to St. Bartholomew's Hospital Medical School. With 46 Illustrations. 8vo, price 12*s.*

* * *

## ANATOMICAL OUTLINES FOR THE USE OF STUDENTS IN THE DISSECTING ROOM.

By ARTHUR HENSMAN, Senior Demonstrator of Anatomy at the Middlesex Hospital. Comprising 117 Plates from original Drawings by ARTHUR E. FISHER, with Explanatory Tables by Mr. HENSMAN. Complete in super-royal 8vo, in Four Parts, each to be had separately. PART I. *The Upper Limb*, 3*s.* 6*d.*; PART II. *The Lower Limb*, 3*s.* 6*d.*; PART III. *The Thorax and Abdomen*, 3*s.* 6*d.*; PART IV. *The Head and Neck*, 3*s.* 6*d.*

* * *

## NOTES ON PHYSIOLOGY FOR THE USE OF STUDENTS PREPARING FOR EXAMINATION.

By HENRY ASHBY, M.D. Lond., Physician to the General Hospital for Sick Children, Manchester; formerly Demonstrator of Physiology, Liverpool School of Medicine. Third Edition, thoroughly revised, with new matter added in several of the Sections. 18mo, price 5*s.*

* * *

## TABLETS OF ANATOMY AND PHYSIOLOGY.

By THOMAS COOKE, F.R.C.S., Senior Assistant-Surgeon to the Westminster Hospital, and Lecturer at the School of Anatomy, Physiology and Operative Surgery. Being a Synopsis of Demonstrations given in the Westminster Hospital Medical School, A.D. 1871-1875. With an Appendix containing most of the New Discoveries of Importance. Anatomy, complete, Second Edition. 4to, price 15*s.* Physiology, complete, Second Edition. 4to, price 10*s.*

⁂ *These* TABLETS *may still be had in separate Fasciculi as originally published.*

## COMPARATIVE ANATOMY AND PHYSIOLOGY OF THE VERTEBRATE ANIMALS.

By RICHARD OWEN, F.R.S., Superintendent of the Nat. Hist. Departments, British Museum. 3 vols. 8vo, with 1,472 Woodcuts, 73*s.* 6*d.*

VOL. I. *Fishes and Reptiles*, with 452 Woodcuts, 21*s.*
VOL. II. *Warm-blooded Vertebrates*, with 406 Woodcuts, 21*s.*
VOL. III. *Mammalia, including Man*, with 614 Woodcuts, 31*s.* 6*d.*

## OUTLINES OF PHYSIOLOGY, HUMAN AND COMPARATIVE.

By JOHN MARSHALL, F.R.S., Professor of Surgery in University College, London; Surgeon to the University College Hospital. With 122 Woodcut Illustrations. 2 vols. crown 8vo, 32*s.*

## HISTOLOGICAL DEMONSTRATIONS.

A Guide to the Microscopical Examination of the Animal Tissues in Health and in Disease; being the Substance of Lectures delivered by G. HARLEY, M.D., F.R.S., formerly Physician to Univ. Coll. Hospital, and Prof. in Univ. Coll. London. Edited by G. T. BROWN, M.R.C.V.S. Second Edition, revised; with Coloured Plate and 220 Woodcuts. Crown 8vo, price 12*s.*

## HEALTH IN THE HOUSE.

Twenty-five Lectures on Elementary Physiology in its application to the Daily wants of Man and Animals. By MRS. C. M. BUCKTON, Member of the Leeds School Board. New and cheaper Edition, thoroughly revised; with 41 Woodcuts and Diagrams. Small 8vo, price 2*s.*

## THE LAWS OF HEALTH.

By W. H. CORFIELD, M.A., M.D. (Oxon.), F.R.C.P. (Lond.), Professor of Hygiene and Public Health, Univ. Coll., London; Medical Officer of Health for St. George's, Hanover Square. With 22 Diagrams engraved on Wood. Fcp. 8vo, 1*s.* 6*d.*

# Medical and Psychological Literature.

## LECTURES ON THE PRINCIPLES AND PRACTICE OF PHYSIC,

Delivered at King's College, London, by SIR THOMAS WATSON, Bart., M.D., F.R.S., Hon. LL.B. Cantab., Hon. D.C.L. Oxon., &c., Physician-in-Ordinary to the Queen. Fifth Edition, revised and enlarged, with two Plates. 2 vols. 8vo, price 36*s.*

## CLINICAL LECTURES AND ESSAYS,

By SIR JAMES PAGET, Bart., F.R.S., D.C.L. Oxon., LL.D. Cantab., &c., Serjeant-Surgeon to the Queen, Surgeon to the Prince of Wales, Consulting-Surgeon to St. Bartholomew's Hospital. Edited by F. HOWARD MARSH, Assistant-Surgeon to St. Bartholomew's Hospital. Second Edition, revised. 8vo, 15*s.*

## EXAMINATION QUESTIONS IN ANATOMY, PHYSIOLOGY, BOTANY, MATERIA MEDICA, SURGERY, MEDICINE, MIDWIFERY, AND STATE-MEDICINE.

Arranged by H. A. HUSBAND, M.B., M.C., M.R.C.S., L.S.A., &c. Second Edition, revised and augmented. 32mo, price 4*s.* 6*d.*

## A DICTIONARY OF MEDICINE.

Edited by RICHARD QUAIN, M.D., F.R.S., Fellow of the Royal College of Physicians, and Physician to the Hospital for Diseases of the Chest at Brompton; assisted by numerous Eminent Writers. In One Volume, 8vo. [*In the Press.*

## THE SENSES AND THE INTELLECT.

By ALEXANDER BAIN, LL.D., Professor of Logic in the University of Aberdeen. Third Edition, with numerous Emendations, and a Review of Darwin on Expression as a Postscript. 8vo, 15*s.*

## THE EMOTIONS AND THE WILL.

By the same Author. Third Edition, thoroughly revised, and in great part re-written. 8vo, price 15*s.*

## MENTAL AND MORAL SCIENCE:

A Compendium of Psychology and Ethics. By the same Author. Fourth Edition. Crown 8vo, 10*s.* 6*d.*

## LOGIC, DEDUCTIVE AND INDUCTIVE.

By the same Author. In Two Parts, crown 8vo, price 10*s.* 6*d.* Each Part may be had separately:—

PART I., *Deduction*, price 4*s.*; PART II., *Induction*, price 6*s.* 6*d.*

## THE HISTORY OF PHILOSOPHY FROM THALES TO COMTE.

By GEORGE HENRY LEWES. Fourth Edition, re-written and greatly enlarged. 2 vols. 8vo, price 32*s.*

## A SYSTEM OF LOGIC, RATIOCINATIVE AND INDUCTIVE;

Being a Connected View of the Principles of Evidence and the Methods of Scientific Investigation. By JOHN STUART MILL. The Tenth Edition. 2 vols. 8vo, price 25*s.*

## ANALYSIS OF J. S. MILL'S SYSTEM OF LOGIC.

By W. STEBBING, M.A. Latest Revised Edition. 12mo, 3*s.* 6*d.*

## HANDBOOK OF J. S. MILL'S SYSTEM OF LOGIC.

By the Rev. A. H. KILLICK, M.A. Third Edition [1877], revised. Crown 8vo, 3*s.* 6*d.*

## Pathology and the Treatment of Disease.

### LECTURES ON SURGICAL PATHOLOGY,

Delivered at the Royal College of Surgeons of England. By Sir JAMES PAGET, Bart., F.R.S., D.C.L. Oxon., LL.D. Cantab., &c., Serjeant-Surgeon to the Queen, Surgeon to the Prince of Wales, Consulting-Surgeon to St. Bartholomew's Hospital. Third Edition, re-edited by the AUTHOR and W. TURNER, M.B. 8vo, with 131 Woodcuts, 21*s.*

### A TREATISE ON MEDICAL ELECTRICITY, THEORETICAL AND PRACTICAL;

And its Use in the Treatment of Paralysis, Neuralgia, and other Diseases. By JULIUS ALTHAUS, M.D., &c., Senior Physician to the Infirmary for Epilepsy and Paralysis. Third Edition, enlarged and revised; with 147 Illustrations engraved on Wood. 8vo, price 18*s.*

### A HANDBOOK ON DISEASES OF THE SKIN,

With especial reference to Diagnosis and Treatment. By ROBERT LIVEING, M.A. & M.D. Cantab., F.R.C.P. Lond., &c., Physician to the Department for Diseases of the Skin at the Middlesex Hospital. Second Edition, enlarged, with a New Chapter on Therapeutics. Fcap. 8vo, price 5*s.*

### NOTES ON THE TREATMENT OF SKIN DISEASES.

By the same Author. Fifth Edition. 18mo, price 3*s.*

### ELEPHANTIASIS GRÆCORUM, OR TRUE LEPROSY;

Being the Goulstonian Lectures for 1873. By the same Author. Cr. 8vo, 4*s.* 6*d.*

### ON BRONCHITIS,

And the Morbid Conditions connected with it. Being Clinical Lectures delivered at the Middlesex Hospital. By E. HEADLAM GREENHOW, M.D., F.R.S., Fellow of the Royal College of Physicians, and Physician to the Middlesex Hospital. Second Edition, revised and greatly enlarged. 8vo, price 10*s.* 6*d.*

### ON ADDISON'S DISEASE,

Being the Croonian Lectures for 1875, delivered before the Royal College of Physicians, revised and illustrated by Reports of Cases. By the same Author. With 5 Plates of Figures (3 coloured). 8vo, price 12*s.* 6*d.*

### CLINICAL LECTURES ON DISEASES OF THE LIVER, JAUNDICE AND ABDOMINAL DROPSY;

Including the Croonian Lectures on Functional Derangements of the Liver delivered at the Royal College of Physicians in 1874. By CHARLES MURCHISON, M.D., LL.D., F.R.S., &c.; Physician and Lecturer on the Principles and Practice of Medicine, St. Thomas's Hospital. Second Edition, thoroughly revised and enlarged; with 37 Illustrations engraved on Wood. 8vo, price 21*s.*

## A TREATISE ON THE CONTINUED FEVERS OF GREAT BRITAIN.

By Charles Murchison, M.D., LL.D., F.R.S., &c., Fellow of the Royal College of Physicians; Physician and Lecturer on the Principles and Practice of Medicine, St. Thomas's Hospital. Second Edition, thoroughly revised and enlarged; with 5 Chromolithographs, 19 Diagrams in Lithography, and 22 Illustrations engraved on Wood. 8vo, price 24*s.*

## TYPHOID FEVER;

Its Nature, Mode of Spreading, and Prevention. By William Budd, M.D., F.R.S. With Four Plates (one coloured). Royal 8vo, price 16*s.*

## A TREATISE ON GOUT AND RHEUMATIC GOUT (RHEUMATOID ARTHRITIS).

By Alfred Baring Garrod, M.D., F.R.S., &c.; Consulting Physician to King's College Hospital. Third Edition, thoroughly revised and enlarged; with 6 Plates, comprising 21 Figures (14 Coloured), and 27 Illustrations engraved on Wood. 8vo, price 21*s.*

## HIMALAYAN AND SUB-HIMALAYAN DISTRICTS OF BRITISH INDIA,

Their Climate, Medical Topography, and Disease Distribution: with reasons for assigning a Malarious Origin to Goître, and some other Diseases. By F. N. Macnamara, M.D., F.R.G.S., Surgeon-Major (retired) Indian Medical Service. With Map and Fever Chart. 8vo, price 21*s.*

## CLINICAL RESEARCHES ON DISEASE IN INDIA.

By Charles Morehead, M.D., Surgeon to the Jamsetjee Jeejeebhoy Hospital. Second Edition, thoroughly revised. 8vo, 21*s.*

## DISEASES OF THE KIDNEY AND URINARY DERANGEMENTS.

By W. Howship Dickinson, M.D. Cantab., F.R.C.P., &c., Physician to, and Lecturer on Medicine at, St. George's Hospital. In Three Parts. Part I.—*Diabetes*, with 3 Plates of Figures and 17 Woodcuts. 8vo, price 10*s.* 6*d.* Part II.—*Albuminuria*, with 11 Plates and 31 Woodcuts, price 20*s.*

⁂ The Two Parts may be had separately, each an independent work: Part I.—*Diabetes*, price 12*s.* cloth. Part II.—Being the Second Edition Revised of Dr. Dickinson's "Pathology and Treatment of Albuminuria," price 21*s.* cloth. Part III., completing the work, is in the Press.

## ON THE USE OF THE LARYNGOSCOPE IN DISEASES OF THE THROAT;

With an Appendix on Rhinoscopy. By Morell Mackenzie, M.D. Lond., Senior Physician to the Hospital for Diseases of the Throat and Chest, and Lecturer on Diseases of the Throat at the London Hospital. Third Edition, revised and enlarged; with 47 Woodcut Illustrations. 8vo, price 6*s.*

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

## DENTAL PATHOLOGY AND SURGERY.

By S. JAMES A. SALTER, M.B., F.R.S., Examiner in Dental Surgery at the College; Dental Surgeon to Guy's Hospital. With 133 Illustrations. 8vo, price 18*s.*

## GUNSHOT INJURIES.

Their History, Characteristic Features, Complications, and General Treatment; with Statistics concerning them as they are met with in Warfare. By Surgeon-General T. LONGMORE, C.B., F.R.C.S., Honorary Surgeon to H.M. Queen Victoria; Professor of Military Surgery in the Army Medical School. With 58 Illustrations. 8vo, price 31*s.* 6*d.*

## PULMONARY CONSUMPTION;

Its Nature, Varieties, and Treatment; with an Analysis of One Thousand Cases to exemplify its Duration. By C. J. B. WILLIAMS, M.D., F.R.S., and T. WILLIAMS, M.A., M.D. Oxon. Post 8vo, 10*s.* 6*d.*

## SAN REMO AND THE WESTERN RIVIERA;

Comprising Bordighera, Mentone, Monaco, Eze, Beaulieu, Villefranche, Nice, Carabaçel, Cimiez, Cannes, Porto Maurizio, Diano Marina, Alassio, Verezzi, Finalmarina, Noli, Monte Grosso, Arenzano, Pegli, Cornigliano, Genoa, and other towns—climatically and medically considered. By ARTHUR HILL HASSALL, M.D. Map and Woodcuts. Crown 8vo, 10*s.* 6*d.*

## WINTERING IN THE RIVIERA;

With Notes of Travel in Italy and France, and Practical Hints to Travellers. By WILLIAM MILLER, S.S.C. Edinburgh. Second and Cheaper Edition, with 12 Lithographic Illustrations. Post 8vo, 7*s.* 6*d.*

# Diseases of Women and Children, and Popular Medical Works.

## THE DIAGNOSIS AND TREATMENT OF DISEASES OF WOMEN, INCLUDING THE DIAGNOSIS OF PREGNANCY.

By GRAILY HEWITT, M.D., Professor of Midwifery and Diseases of Women, University College, and Obstetric Physician to the Hospital; Examiner in Obstetric Medicine to the University of London. Third Edition. 8vo, with 132 Engravings on Wood, price 24*s.*

## THE MECHANICAL SYSTEM OF UTERINE PATHOLOGY.

Being the Harveian Lectures delivered before the Harveian Society of London, December, 1877. By the same Author. With 31 Life-size Illustrations prepared expressly for this Work. Crown 4to, 7*s.* 6*d.*

## LECTURES ON THE DISEASES OF INFANCY AND CHILDHOOD.

By CHARLES WEST, M.D., &c., Physician to the Hospital for Sick Children. Sixth Edition, revised and enlarged. 8vo, 18*s.*

## HINTS TO MOTHERS FOR THE MANAGEMENT OF THEIR HEALTH DURING THE PERIOD OF PREGNANCY AND IN THE LYING-IN ROOM:

With an Exposure of Popular Errors in connection with those subjects, and Hints on Nursing. By THOMAS BULL, M.D. New and Cheaper Edition, thoroughly revised and improved. Fcap. 8vo, price 2*s.* 6*d.*

## THE MATERNAL MANAGEMENT OF CHILDREN IN HEALTH AND DISEASE.

By the same Author. New and cheaper Edition, thoroughly revised and improved. Fcap. 8vo, price 2*s.* 6*d.*

## THE HANDBOOK FOR MIDWIVES.

By HENRY FLY SMITH, M.B. Oxon., M.R.C.S., late Assistant-Surgeon at the Hospital for Sick Women, Soho Square. With 41 Woodcuts. Crown 8vo, price 5*s.*

# Materia Medica and Therapeutics.

## THOMSON'S CONSPECTUS ADAPTED TO THE BRITISH PHARMACOPŒIA.

By EDMUND LLOYD BIRKETT, M.D., &c., Physician to the City of London Hospital for Diseases of the Chest. Latest Edition, with Supplement containing Notices of the Medicines and Preparations added in 1874 to the British Pharmacopœia. 18mo, 6*s.*

## THE ESSENTIALS OF MATERIA MEDICA AND THERAPEUTICS.

By ALFRED BARING GARROD, M.D., F.R.S., Fellow of the Royal College of Physicians; Consulting Physician to King's College Hospital; late Professor of Therapeutics at King's College, London. The Ninth Edition, revised and edited, under the supervision of the Author, by E. B. BAXTER, M.D., F.R.C.P., Professor of Materia Medica and Therapeutics in King's College, London; Senior Physician to the Evelina Hospital for Sick Children; Assistant-Physician to King's College Hospital. Crown 8vo, price 12*s.* 6*d.*

## DR. PEREIRA'S MATERIA MEDICA AND THERAPEUTICS,

Abridged, and adapted for the use of Medical and Pharmaceutical Practitioners and Students. Edited by Professor R. BENTLEY, M.R.C.S., F.L.S., and by Professor T. REDWOOD, Ph.D., F.C.S. With an Appendix containing the New Medicines included in 1874 by the Medical Council in the British Pharmacopœia, and Commentaries thereon by the Editors. 8vo, with 126 Woodcuts, price 25*s.*

## Chemistry.

### DICTIONARY OF CHEMISTRY AND THE ALLIED BRANCHES OF OTHER SCIENCES.

By Henry Watts, F.R.S., Editor of the Journal of the Chemical Society, assisted by eminent Scientific and Practical Chemists. With a Third Supplement, completing the Record of Chemical Discovery to the end of the year 1878, including the more Important Discoveries made in 1879 and 1880. 9 vols. 8vo, price £15 2*s.* 6*d.*

* * *

### ELEMENTS OF CHEMISTRY,

Theoretical and Practical. By William Allen Miller, M.D., D.C.L., LL.D., late Professor of Chemistry in King's College, London. Part I.—*CHEMICAL PHYSICS.* Sixth Edition, revised by Herbert McLeod, F.C.S., Professor of Experimental Science, Royal Indian Engineering College, Cooper's Hill. With 274 Woodcuts. 8vo, price 16*s.*

### MILLER'S ELEMENTS OF CHEMISTRY, Part II.

*INORGANIC CHEMISTRY.* Sixth Edition, revised throughout, with Additions by C. E. Groves, Secretary to the Institute of Chemistry of Great Britain and Ireland, and Fellow of the Chemical Societies of London, Paris, and Berlin. With 376 Woodcuts. 8vo, price 24*s.*

### MILLER'S ELEMENTS OF CHEMISTRY, Part III.

*ORGANIC CHEMISTRY,* or the Chemistry of Carbon Compounds (in Two Sections). Section I. *Hydrocarbons, Alcohols, Ethers, Aldehydes and Paraffinoid Acids.* Fifth Edition, revised and in great part re-written, by H. E. Armstrong, F.R.S., Sec. Chem. Soc.; and C. E. Groves, F.C.S., Sec. Inst. Chem. 8vo, price 31*s.* 6*d.*

* * *

### INTRODUCTION TO THE STUDY OF INORGANIC CHEMISTRY.

By William Allen Miller, M.D., D.C.L., LL.D., late Professor of Chemistry in King's College, London. With 71 Figures on Wood. Small 8vo, price 3*s.* 6*d.*

* * *

### QUANTITATIVE CHEMICAL ANALYSIS.

By T. E. Thorpe, Ph.D., F.R.S.E., Professor of Chemistry in the Andersonian University, Glasgow. With 88 Woodcuts. Small 8vo, 4*s.* 6*d.*

* * *

### QUALITATIVE CHEMICAL ANALYSIS AND LABORATORY PRACTICE.

By T. E. Thorpe, Ph.D., F.R.S.E., Professor of Chemistry in the Andersonian University, Glasgow; and M. M. Pattison Muir. With Plate and 57 Woodcuts. Small 8vo, price 3*s.* 6*d.*

* * *

### A COURSE OF PRACTICAL CHEMISTRY,

Arranged for the use of Medical Students, with express reference to the Three Months' Summer Practice. By William Odling, M.A., F.R.S. Fifth Edition, with 71 Woodcuts. Crown 8vo, price 6*s.*

## PRACTICAL INORGANIC CHEMISTRY.

An Elementary Text-Book of Theoretical and Practical Inorganic Chemistry, designed chiefly for the use of Students of Science Classes connected with the Science and Art Department of the Committee of Council on Education. By WILLIAM JAGO, F.C.S., &c., Science Master at Brighton College. With 37 Woodcuts. Fcap. 8vo, 2*s*.

## INTRODUCTION TO THE STUDY OF ORGANIC CHEMISTRY;

The Chemistry of Carbon and its Compounds. By H. E. ARMSTRONG, F.R.S., Sec. Chem. Soc. 2nd Edition, with 8 Woodcuts. Small 8vo, 3*s*. 6*d*.

## CHEMICAL NOTES FOR THE LECTURE ROOM—ON HEAT, LAWS OF CHEMICAL COMBINATION, AND CHEMISTRY OF THE NON-METALLIC ELEMENTS.

By THOMAS WOOD, Ph.D., F.C.S. Third Edition. Crown 8vo, 5*s*.

NOTES ON THE METALS, by the same Author, Second Edition, price 5*s*.

## PRACTICAL CHEMISTRY;

The Principles of Qualitative Analysis. By WILLIAM A. TILDEN, D. Sc. Lond. F.C.S. Fcp. 8vo, price 1*s*. 6*d*.

## INTRODUCTION TO THE STUDY OF CHEMICAL PHILOSOPHY;

The Principles of Theoretical and Systematic Chemistry. By the same Author. With 5 Woodcuts. Small 8vo, 3*s*. 6*d*.

## ANNALS OF CHEMICAL MEDICINE;

Including the Application of Chemistry to Physiology, Pathology, Therapeutics, Pharmacy, Toxicology, and Hygiene. Edited by J. L. W. THUDICHUM, M.D. With Woodcuts. Vols. I. and II., price 14*s*. each.

## THE ART OF ELECTRO-METALLURGY,

Including all known Processes of Electro-Deposition. By G. GORE, LL.D., F.R.S. With Woodcuts and Diagrams. Small 8vo, 6*s*.

## EXPERIMENTAL CHEMISTRY

For Junior Students. By J. EMERSON REYNOLDS, M.D., F.R.S., Professor of Chemistry, Univ. of Dublin. PART I. *Introductory*. Fcp. 8vo, 1*s*. 6*d*.

## THE HISTORY, PRODUCTS, AND PROCESSES OF THE ALKALI TRADE.

Including the most recent Improvements. By CHARLES THOMAS KINGZETT, F.P.C., F.C.S. Lond. & Berlin. 8vo, with 30 Woodcuts, 12*s*.

## ANIMAL CHEMISTRY;

Or, the Relations of Chemistry to Physiology and Pathology: a Manual for Medical Men and Scientific Chemists. By the same Author. 8vo, price 18*s*.

### SELECT METHODS IN CHEMICAL ANALYSIS, CHIEFLY INORGANIC.

By W. CROOKES, F.R.S., V.P.C.S. With 22 Woodcuts. Crown 8vo, 12*s*. 6*d*.

### ON ARTIFICIAL MANURES,

Their Chemical Selection and Scientific Applications to Agriculture; a series of Lectures given at the Experimental Farm, Vincennes, in 1867 and 1874–75. By GEORGES VILLE. Translated and edited by W. CROOKES, F.R.S., V.P.C.S. With 31 Illustrations engraved on Wood. 8vo, price 21*s*.

### ANTHRACEN;

Its Constitution, Properties, Manufacture, and Derivatives, including Artificial Alizarin, Anthrapurpurin, &c., with their Applications in Dyeing and Printing. By G. AUERBACH. Translated by W. CROOKES, F.R.S., V.P.C.S. 8vo, price 12*s*.

### A PRACTICAL HANDBOOK OF DYEING AND CALICO PRINTING.

By W. CROOKES, F.R.S., V.P.C.S. With 11 Page Plates, 49 Specimens of Dyed and Printed Fabrics, and 36 Woodcuts. 8vo, price 42*s*.

### INDUSTRIAL CHEMISTRY;

A Manual for use in Technical Colleges or Schools, also for Manufacturers and others, based on a Translation of Stohmann and Engler's German Edition of PAYEN'S *Précis de Chimie Industrielle*. Edited and supplemented with Chapters on the Chemistry of the Metals, &c., by B. H. PAUL, Ph.D. With 698 Woodcuts. Medium 8vo, 42*s*.

### PIESSE'S ART OF PERFUMERY,

And Methods of obtaining the Odours of Plants; the Growth and General Flower Farm System of raising Fragrant Herbs; with Instructions for the Manufacture of Perfumes for the Handkerchief, Scented Powders, Odorous Vinegars and Salts, Snuff, Dentifrices, Cosmetics, Perfumed Soap, &c. To which is added an Appendix on Preparing Artificial Fruit Essences, &c. Fourth Edition, with 100 Woodcuts. Square crown 8vo, 21*s*.

## Science and Natural History.

### BRANDE'S DICTIONARY OF SCIENCE, LITERATURE, AND ART;

Comprising the Definitions and Derivations of the Scientific Terms in general use, together with the History and Descriptions of the Scientific Principles of nearly every branch of Human Knowledge. Re-edited by the Rev. Sir G. W. Cox, Bart., M.A. 3 vols. medium 8vo, 63*s*.

### URE'S DICTIONARY OF ARTS, MANUFACTURES, AND MINES;

Containing a clear Exposition of their Principles and Practice. The Seventh Edition, completely revised and greatly enlarged by ROBERT HUNT, F.R.S., Keeper of Mining Records, assisted by F. W. RUDLER, F.G.S. and by numerous Contributors. With 2,604 Woodcuts. 4 vols. medium 8vo, price 7*l*. 7*s*.

## ELEMENTARY TREATISE ON PHYSICS;

Experimental and Applied, for the use of Colleges and Schools. Translated and edited from GANOT's *Eléments de Physique* (with the Author's sanction) by E. ATKINSON, Ph.D., F.C.S., Professor of Experimental Science, Staff College, Sandhurst. Tenth Edition, revised and enlarged, with 4 Coloured Plates and 844 Woodcuts. Large crown 8vo, price 15*s.*

## NATURAL PHILOSOPHY FOR GENERAL READERS AND YOUNG PERSONS;

Being a Course of Physics divested of Mathematical Formulæ, and expressed in the language of daily life. Translated from GANOT's *Cours de Physique* (with the Author's sanction) by E. ATKINSON, Ph.D., F.C.S. Fourth Edition, carefully revised; with 25 pages of New Matter, 2 Coloured Plates, and 471 Woodcuts, of which 16 are New in this Edition. Crown 8vo, price 7*s.* 6*d.*

## ARNOTT'S ELEMENTS OF PHYSICS OR NATURAL PHILOSOPHY.

Seventh Edition, edited by A. BAIN, LL.D., and A. S. TAYLOR, M.D., F.R.S. Crown 8vo, Woodcuts, 12*s.* 6*d.*

## HEAT A MODE OF MOTION.

By JOHN TYNDALL, LL.D., D.C.L., F.R.S., Professor of Natural Philosophy in the Royal Institution of Great Britain. Sixth Edition (Thirteenth Thousand), thoroughly revised and enlarged; with Frontispiece and 123 Woodcuts. Crown 8vo, 12*s.*

## SOUND.

By the same Author. A New Edition, being the Fourth, thoroughly revised, and including Recent Researches. Crown 8vo, with Woodcuts. [*In the Press.*

## LECTURES ON LIGHT delivered in America in 1872 and 1873.

By the same Author. Second Edition, with Portrait engraved on Steel, 1 Lithographic Plate, and 59 Diagrams. Crown 8vo, price 7*s.* 6*d.*

## LESSONS IN ELECTRICITY AT THE ROYAL INSTITUTION OF GREAT BRITAIN, 1875–76.

By the same Author. With 58 Woodcuts. Crown 8vo, 2*s.* 6*d.*

## NOTES OF A COURSE OF SEVEN LECTURES ON ELECTRICAL PHENOMENA AND THEORIES.

By the same Author. Crown 8vo, price 1*s.* sewed, or 1*s.* 6*d.* cloth.

"Every one desiring to study the phenomena of Electricity or Light, or to make acquaintance with the views which prevail in the philosophical world, will find great assistance by a careful perusal of these Notes. Especially we think they will be found useful in the Science Classes under the Science and Art Department of the Committee of Council on Education."—*Athenæum.*

## NOTES OF A COURSE OF NINE LECTURES ON LIGHT.

By the same Author. Crown 8vo, 1*s.* sewed, or 1*s.* 6*d.* cloth.

## FRAGMENTS OF SCIENCE;

A Series of Detached Essays, Addresses, and Reviews. By the same Author. Sixth Edition, revised and augmented. 2 vols, post 8vo, 16*s.*

## RESEARCHES ON THE FLOATING MATTER OF THE AIR IN RELATION TO PUTREFACTION AND INFECTION.

With 24 Woodcuts. Crown 8vo, 7*s.* 6*d.*

### AIR AND RAIN;

The Beginnings of a Chemical Climatology. By ROBERT ANGUS SMITH, Ph.D., F.R.S., F.C.S. (General) Inspector of Alkali Works for the Government. With 8 Illustrations. 8vo, price 24*s.*

### THE CORRELATION OF PHYSICAL FORCES.

Sixth Edition, with other contributions to Science. By the Hon. Sir W. R. GROVE, M.A., F.R.S., one of the Judges of the Court of Common Pleas. 8vo, price 15*s.*

### A SHORT MANUAL ON HEAT FOR THE USE OF SCHOOLS AND SCIENCE CLASSES.

By the Rev. A. IRVING, B.A. and B.Sc., Second Master of the High School, Nottingham. With 33 Diagrams. Small 8vo, price 2*s.* 6*d.*

### THEORY OF HEAT.

By J. CLERK MAXWELL, M.A., LL.D. Edin., F.R.SS. L. & E., Professor of Experimental Physics in the University of Cambridge. With 41 Woodcuts and Diagrams. Small 8vo, price 3*s.* 6*d.*

### THERMODYNAMICS.

By RICHARD WORMELL, D.Sc., M.A., Head-Master of the Middle-Class Corporation School, London. Edited by Professor G. C. FOSTER, F.R.S., and P. MAGNUS, B.Sc., B.A. With 41 Diagrams. Fcp. 8vo, price 1*s.* 6*d.*

### ELEMENTS OF ASTRONOMY.

By ROBERT S. BALL, LL.D., F.R.S., Professor of Astronomy in the University of Dublin, and Royal Astronomer of Ireland. With 136 Figures and Diagrams. Small 8vo, price 6*s.*

### OUTLINES OF ASTRONOMY.

By Sir JOHN F. W. HERSCHEL, Bart., K.H., &c., Member of the Institute of France. Twelfth Edition, with 9 Plates, and numerous Diagrams. Square crown 8vo, price 12*s.*

### A NEW STAR ATLAS,

For the Library, the School, and the Observatory, in Twelve Circular Maps (with Two Index Plates). Intended as a Companion to 'Webb's Celestial Objects for Common Telescopes.' With a Letterpress Introduction on the Study of the Stars, illustrated by 9 Diagrams. By RICHARD A. PROCTOR, B.A., Hon. Sec. R.A.S. Crown 8vo, price 5*s.*

### SPECTRUM ANALYSIS,

In its Application to Terrestrial Substances and the Physical Constitution of the Heavenly Bodies. Familiarly explained by Dr. H. SCHELLEN, Director der Realschule, Cologne. Translated from the German by JANE and CAROLINE LASSELL; edited, with Notes, by W. HUGGINS, LL.D., F.R.S. With 13 Plates (6 Coloured), including Angström's and Kirchhoff's Maps, and 223 Woodcuts. 8vo, price 28*s.*

### THE SUN: RULER, LIGHT, FIRE, AND LIFE OF THE PLANETARY SYSTEM,

By RICHARD A. PROCTOR, B.A. Third Edition, revised; with 9 Plates (7 coloured) and 110 Figures engraved on Wood. Crown 8vo, price 14*s.*

### THE MOON;

Her Motions, Aspects, Scenery, and Physical Condition. By the same Author. With Plates, Charts, Woodcuts, and Lunar Photographs. Crown 8vo, 10*s.* 6*d.*

### OTHER WORLDS THAN OURS;

The Plurality of Worlds Studied under the Light of Recent Scientific Researches. By the same Author. Fourth Edition, revised and enlarged; with 14 Illustrations (6 coloured). Crown 8vo, price 10*s.* 6*d.*

### THE ORBS AROUND US;

A Series of Familiar Essays on the Moon and Planets, Meteors and Comets, the Sun and Coloured Pairs of Suns. By the same Author. Second Edition, with Chart and 4 Diagrams. Crown 8vo, price 7*s.* 6*d.*

### ESSAYS ON ASTRONOMY;

A Series of Papers on Planets and Meteors, the Sun and Sun-surrounding Space, Stars, and Star Cloudlets; and a Dissertation on the approaching Transit of Venus. By the same Author. With 10 Plates and 24 Woodcuts. 8vo, price 12*s.*

### A TREATISE ON THE CYCLOID,

And on all forms of Cycloidal Curves, and on the use of Cycloidal Curves in dealing with the Motions of Planets, Comets, &c., and of Matter projected from the Sun. By the same Author. Crown 8vo, 10*s.* 6*d.*

### LIGHT SCIENCE FOR LEISURE HOURS;

A Series of Familiar Essays on Scientific Subjects, Natural Phenomena, &c. By the same Author. First and Second Series. Crown 8vo, 7*s.* 6*d.* each.

* * *

### A HANDBOOK OF PRACTICAL TELEGRAPHY.

By R. S. CULLEY, Member Inst. C.E., Engineer-in-chief of Telegraphs to the Post Office. The Seventh Edition, revised and enlarged; with 132 Woodcuts and 18 Lithographic Plates of Apparatus. 8vo, price 16*s.*

* * *

### TEXT-BOOK OF TELEGRAPHY.

By W. H. PREECE, C.E., Divisional Engineer, P.O. Telegraphs; and J. SIVEWRIGHT, M.A., Superintendent (Engineering Department) P.O. Telegraphs. With 160 Figures and Diagrams engraved on wood. Small 8vo, 3*s.* 6*d.*

* * *

### A TREATISE ON PHOTOGRAPHY.

By W. DE WIVELESLIE ABNEY, F.R.S., Captain in the Corps of Royal Engineers, late Instructor in Chemistry and Photography, School of Military Engineering, Chatham. With 105 Diagrams. Small 8vo, 3*s.* 6*d.*

## TEXT-BOOK OF SYSTEMATIC MINERALOGY.

By HILARY BAUERMAN, F.G.S., Associate of the Royal School of Mines. With 372 Woodcuts. Small 8vo, 6*s.*

"The present text-book, which completes the Systematic division of the Science, is to be followed by another upon Descriptive Mineralogy. If the forthcoming volume is prepared with the same ability and painstaking care which is exhibited in that now before us, the two will constitute a trustworthy elementary treatise which cannot fail to be of the highest value to students of mineralogy."—*Philosophical Magazine.*

## METALS, THEIR PROPERTIES AND TREATMENT.

By CHARLES LOUDON BLOXAM, Professor of Chemistry in King's College, London. With 105 Figures on Wood. Small 8vo, price 3*s.* 6*d.*

## MANUAL OF PRACTICAL ASSAYING.

By JOHN MITCHELL, F.C.S. Fourth Edition, in which are incorporated all the recent valuable improvements in Assaying; including Volumetric and Colorimetric Assays, and the Blowpipe Assays. Edited and re-written by W. CROOKES, F.R.S., with 199 Woodcuts. 8vo, 31*s.* 6*d.*

## A PRACTICAL TREATISE ON METALLURGY,

Adapted from the last German Edition of Professor KERL'S *Metallurgy*, by WILLIAM CROOKES, F.R.S., and ERNST RÖHRIG, Ph.D. 3 vols. 8vo, price 4*l.* 19*s.*

## THE TREASURY OF BOTANY, OR POPULAR DICTIONARY OF THE VEGETABLE KINGDOM;

With which is incorporated a Glossary of Botanical Terms. Edited by J. LINDLEY, M.D., F.R.S., and T. MOORE, F.L.S., assisted by numerous Contributors. With 20 Steel Plates, and numerous Woodcuts from Original Designs by W. H. FITCH. 2 Parts, fcap. 8vo, 12*s.*

## LOUDON'S ENCYCLOPÆDIA OF PLANTS:

Comprising the Specific Character, Description, Culture, History, Application in the Arts, and every other desirable particular respecting all the plants indigenous to, cultivated in, or introduced into, Britain. Corrected by Mrs. LOUDON. 8vo, with above 12,000 Woodcuts, price 42*s.*

## DECAISNE & LE MAOUT'S GENERAL SYSTEM OF DESCRIPTIVE AND ANALYTICAL BOTANY.

Translated from the French by MRS. HOOKER. The Orders arranged after the Method followed in the Universities and Schools of Great Britain, its Colonies, America, and India, with Additions, an Appendix on the Natural Method, and a Synopsis of the Orders, by J. D. HOOKER, C.B., F.R.S. With 5,500 Woodcuts. Imperial 8vo, 31*s.* 6*d.*

## TEXT-BOOK OF STRUCTURAL AND PHYSIOLOGICAL BOTANY.

By Professor OTTO W. THOMÉ. Translated and edited by A. W. BENNETT, M.A., B. Sc., F.L.S., Lecturer on Botany at St. Thomas's Hospital. With Map and 600 Woodcuts. Small 8vo, 6*s.*

# Index.

Abney's Photography . . . 14
Althaus's Medical Electricity . . 5
Armstrong's Organic Chemistry . 10
Arnott's Elements of Physics . . 12
Ashby's Notes on Physiology . . 2
Auerbach on Anthracen . . . 11
Bain on the Emotions and Will . 4
—— on Mental and Moral Science 4
—— on the Senses and Intellect . 4
Bain's Logic . . . . . . 4
Ball's Text-book of Astronomy . . 13
Bauerman's Mineralogy . . . 15
Bloxam on Metals . . . . 15
Brande's Dictionary of Science, Literature, and Art . . . 11
Buckton's Physiological Lectures . 3
Budd on Typhoid Fever . . 6
Bull's Hints to Mothers . . . 8
—— Management of Children . 8
Cooke's Tablets of Anat. and Phys. 2
Corfield's Laws of Health . . 3
Crookes on Chemical Analysis . . 11
——'s Handbook on Dyeing . 11
Culley's Handbook of Telegraphy . 14
Decaisne and Le Maout's Botany . 15
Dickinson on Diseases of the Kidney 6
Erichsen's Surgery . . . 1
Ganot's Natural Philosophy . . 12
—— Physics . . . . 12
Garrod on Gout . . . . 6
Garrod's Materia Medica . . 8
Gore's Electro-Metallurgy . . . 10
Gray's Anatomy . . . . . 2
Greenhow on Addison's Disease . 5
—— Bronchitis . . . 5
Grove's Correlation of Physical Forces 13
Harley's Histological Demonstrations 3
Hassall's San Remo and the Western Riviera . . . . . . 7
Hensman's Anatomical Outlines . 2
Herschel's Outlines of Astronomy . 13
Hewitt on the Diseases of Women . 7
—— on Uterine Pathology . 7
Holmes's Surgery . . . . 1
Husband's Examination Questions . 4
Irving's Manual of Heat . . . 13
Jago's Inorganic Chemistry . . 10
Kerl's Metallurgy . . . . 15
Kingzett's Animal Chemistry . . 10
—— Alkali . . . . 10
Lewes's History of Philosophy . 4
Lindley's Treasury of Botany . . 15
Liveing Diseases of the Skin . . 5
—— Treatment of ditto . 5
—— Leprosy . . . . 5
Longmore on Gunshot Injuries . 7
Loudon's Encyclopædia of Plants . 15
Mackenzie on Laryngoscope . . 6
Macnamara's Ind. Med. Geography 6
Marshall's Outlines of Physiology . 3
Maxwell's Theory of Heat . . 13
Mill's System of Logic . . . 4
Miller's Elements of Chemistry . 9
—— Inorganic Chemistry . . 9
—— Wintering in the Riviera . 7
Mitchell's Assaying . . . 15
Morehead on Disease in India . . 6
Murchison on Continued Fevers . 6
—— on Diseases of the Liver 5
Odling's Practical Chemistry . . 9
Owen's Comparative Anatomy and Physiology of Vertebrata . 3
Paget's Clinical Lectures and Essays 3
—— Surgical Pathology . . 5
Payen's Industrial Chemistry . . 11
Pereira's Elements of Materia Medica 8
Piesse's Art of Perfumery . . . 11
Preece and Sivewright's Telegraphy 14
Proctor on Plurality of Worlds . . 14
—— on the Sun . . . 14
—— on the Moon . . . 14
Proctor's Astronomical Essays . 14
—— New Star Atlas . . . 13
—— Orbs Around us . . 14
—— Scientific Essays . . . 14
—— Treatise on the Cycloid . 14
Quain's Anatomy . . . . 2
—— Medical Dictionary . . 4
Reynolds's Experimental Chemistry 10
Salter's Dental Pathology and Surgery 7
Schellen's Spectrum Analysis . . 13
Smith's Air and Rain . . . 13
—— Handbook for Midwives . 8
—— Operative Surgery on the Dead Body . . . . 2
Thomé's Structural and Phys. Botany 15
Thomson's Conspectus, by Birkett . 8
Thorpe's Quantitative Analysis . . 9
Thorpe & Muir's Qualitative Analysis 9
Thudichum's Annals of Chemical Medicine . . . . . 10
Tilden's Chemical Philosophy . 10
—— Practical Chemistry . . 10
Tyndall on Putrefaction . . . 12
Tyndall's Fragments of Science . 12
—— Lectures on Heat . . 12
—— Light . . 12
—— Sound . . 12
—— Lessons in Electricity . 12
—— Notes on Electricity . 12
—— Notes on Light . . 12
Ure's Dictionary of Arts, Manufactures, and Mines . . . 11
Ville on Artificial Manures . . 11
Watson's Principles and Practice of Physic . . . . . . 3
Watts's Dictionary of Chemistry . 9
West on the Diseases of Children . 7
Williams on Consumption . . 7
Wood's Chemical Notes . . 10
—— Notes on the Metals . . 10
Wormell's Thermodynamics . . 13

BRADBURY, AGNEW, & CO., PRINTERS, WHITEFRIARS.

LIBRARY OF THE

10

**RETURN TO →** **MAIN CIRCULATION**

ALL BOOKS ARE SUBJECT TO RECALL
RENEW BOOKS BY CALLING **642-3405**

**DUE AS STAMPED BELOW**

| | | |
|---|---|---|
| SENT ON ILL | | |
| JAN 2 7 1995 | | |
| U. C. BERKELEY | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

FORM NO. DD6

UNIVERSITY OF CALIFORNIA, BERKELEY
BERKELEY, CA 94720

YD 28989

QD5
W4
1875
v. 2

78291